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ARCHIVES OF OTOLOGY

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ARCHIVES OF OTOLOGY.

ON THE CUPULA-FORMATIONS IN THE HUMAN LABYRINTH.

By H. STEINBRÜGGE,

LECTURER ON OTOTOLOGY IN THE UNIVERSITY OF GIESSEN.

IF after the publication of the researches of expert histologists on the so-called cupula-formations, and especially after the completion of Retzius' masterwork, I take up once more this theme, the undertaking may seem at least superfluous, and requires in a manner that I should state the reason for doing so. This I now beg to seek in the difficulty of the object, which has not thus far permitted a perfectly satisfactory solution of the questions relating thereto, and which induces me to hope that even minor contributions, aiming at the attainment of a better understanding, may not as yet appear entirely worthless.

By the aid of the celloidin method we succeed oftener now than formerly in fixing surprisingly beautiful sections of the cupula-formation upon the nerve epithelium of the membranous labyrinth. Based on more recent microscopic preparations made by means of this method, I believe that the formations upon the macula of the untricus and sacculus, known as covering membranes or cementing substances of the otoliths, should be interpreted in the same manner as the cupula terminalis of the ampullæ,—namely, as products of coagulation. This point especially seems to me to be in need of further elucidation, notwithstanding the admirable researches of the writers on this subject.

Before entering upon the consideration of these formations I shall briefly recapitulate, however, some of the data relating to the cupula of the ampullæ.

While the authors following Lang, who first found these formations in the labyrinth of the Cyprinoids, generally regarded it as a firm, laminated cuticular formation, Hensen, in the year 1872,¹ showed by investigations of the living gobius that the so-called auditory hairs in the ampulla were considerably longer than they were at that time assumed to be (contrary to the statement of Max Schultze), and furthermore endeavored to prove that the cupula terminalis was produced artificially by the swelling and matting together of the hairs as the result of the action of the nitric acid and alcohol, and finally that the striation of the cupula was merely due to the swollen and entangled hairs.

But as this view failed to receive the desired attention, and at that time was even contradicted by some writers, Hensen repeated his examination of the gobius, the sole, the eel, and the haddock, as well as on the *Rana esculenta*, and published a supplement to his remarks against the cupula terminalis (Lang²). In this supplement Hensen maintains his assertion that during life and in fresh preparations no cupula can be discovered, and that this is in consequence of the ability of the hairs to lay their ends alongside of one another; it could not be present even in an invisible state as a solid substance, and that it could be produced from the hairs by the action of nitric acid and alcohol as well as by osmic acid. At the same time it was stated, however, by Hensen, that the labyrinth should not be touched before the acid is applied, as otherwise no cupula would form, and he even arrives at the conclusion that a substance in a state of solution was present between and around the hairs, which contributed to the formation of the cupula and was even necessary thereto. The slightest touch will be sufficient to displace this substance. "One may assume that it is a substance similar to fibrinogen."

In a review, which I published in 1882, of the above-mentioned paper by Hensen, I wrote as follows: "If we should try to bring Hensen's views on the cupula in harmony with those of his opponents, it might perhaps be

¹ *Arch. f. Anatomie u. Physiologie, Anatom. Abtheil.*, p. 486.

² The same *Arch.* for the year 1881, p. 405.

done in the following manner: a firm organized formation, to which the term *cupula terminalis* could be applied, does not exist during life; but later investigations by other writers have clearly shown that there is present upon the *cristæ* of the *ampullæ*, between the small hairs and in their vicinity a gelatinous substance which during life or in fresh preparations is transparent and cannot therefore be seen with the (low-power?) microscope. This substance, which is chemically different from the rest of the endolymph, coagulates when treated with nitric acid, chromic acid, osmic acid, or alcohol, and in combination with the small hairs furnishes the peculiar striated formation which Lang calls the *cupula terminalis*." And further: "The merits of having refuted the assumption of an organized firm cupula would thus not be taken from the author, and to his opponents might be conceded that the glueing together of the so-called hairs in the *ampullæ*, which in man do not by any means attain the same length as in the fishes and amphibia, does not constitute the only and essential factor in the formation of the cupula, and that on the other hand this term might well be retained for this, from a physiological point of view, certainly important substance."

This view, as the quotations given below will show, is now also shared by Retzius¹ and Hasse. It now only remains for me to rectify the passage referring to the length of the auditory hairs in the human *ampullæ*, in the above-mentioned remark, as my recent preparations of cupula from the human labyrinth have made it to me also more probable that the hairs reach up to the summit of the cupula-formation. The gelatinous or semi-fluid substance probably contracts during its coagulation, and thus the coagulated mass appears lifted off from the nerve-epithelium, and only a few broken short hairs are preserved upon

¹ On page 364 of his great work Retzius, in speaking of Hensen's investigations with reference to the assertion that a substance in solution is present between and around the hairs, says: With this, in my opinion, Hensen has after all assumed the existence of a kind of cupula, a fluid cupula; although this cupula is something entirely different from the cupula described by Lang, Hasse, myself, Kuhn, and P. Meyer. Finally the passage in which Retzius gathers together his views on the cupula question is quoted literally in Moos' review of Retzius' work in these *ARCHIVES*, vol. xiv., page 298, fourth line from the top, to which the reader is referred.

the epithelial cells. One may thus easily mistake these remnants for the true representation of the hairs. Occasionally it is possible, however, to trace a connection between a few of the hairs visible in the empty interstices and the striæ in the cupula, especially in preparations in which the latter is found but a short distance from the epithelium.

But as the statements as to the length of the hairs have heretofore mostly referred to the ampullæ of the lower vertebrates, it has seemed to me to be of the greatest interest to compare the latest measurements, given by Retzius in his description of the human labyrinth, with those made by myself. It is stated on page 342 of Retzius' work that the length of the hairs on the cells of the maculæ in the sacculæ of the human labyrinth is from 0.02 to 0.025 *mm*, while the hairs on the cristæ are longer and sometimes measure as much as 0.028 *mm*. This difference is of course very insignificant, but Retzius adds that in all probability the hairs on the cells of the cristæ, in an un mutilated condition, are longer. With the latter statement we agree, and assume that the above statement, as to the length being 0.028 *mm*, refers only to the before-mentioned remnants of auditory hairs, exclusive of the cupula-formation. For on the supposition that the height of the cupula corresponds to the length of the hairs, since the fine striation can be traced to the summit of the cupula, a much larger measurement is obtained. In the sections of the human ampullæ measured by myself, the distance from the middle of the crista-epithelium to the roof of the ampulla was 1.36 *mm*, and the height of the cupula measured in the same line was 0.8 to 0.9 *mm*—therefore two thirds of the ampullar space. If to this we add the effects of the shrinking of the fluid cupula, whereby the auditory hairs are bent over somewhat at their ends, the length of the hairs in the living man can be estimated certainly at 1 *mm*.

Furthermore, I must recur to a statement by Hasse, which occurs incidentally in a review of Retzius' great work, in the *Arch. für Ohrenheilkunde* (vol. xxi., page 317, eleventh line from the top). Hasse makes known there his

inclination to side with Retzius and Hensen as regards the cupula-formation, and then continues:

"But one doubt I beg to mention. Out of the auditory hairs alone, even if they are swollen, the mass of the membrana tectoria cannot be formed: it is too large for that. It is therefore necessary to call to our aid a coagulating intermediate substance. But if we assume the presence of such a substance, it is remarkable that it is present nowhere else in the endolymphatic space, and that at no other place than at the *cristæ acusticæ* a coagulation of the endolymph occurs."

With regard to the concluding sentence, that coagulations of this kind within the endolymphatic space are not found at other places, the question may be asked: Are not the so-called membranes of the otoliths in the *sacculæ*, the soft, almost mucous layer which holds the otoliths together (Henle), the tenacious gelatinous substance (Rüdinger), the mass resembling the vitreous tumor (Max Schultze), products of coagulation similar to the cupula ampullæ, since the nerve-epithelium of the *maculæ* and *cristæ*, which is said to furnish these excretions, is in its structure almost alike?

This question will be found justifiable if the accounts given by some of the most competent authors of the substance which unites the otoliths with the *maculæ* are placed together.

In Retzius' work, in the chapter relating to the human labyrinth (vol. ii., p. 342), we find: "Upon the *maculæ acusticæ* rests, as is well known, the very thin membrane of the otoliths, on the surface of which lie in a single layer the numerous smaller crystals, measuring from 0.001 to 0.015 mm."¹

¹ In other mammals Retzius describes this structureless membrane as of a gelatinous, mucous character. In the fishes are described homogeneous membranæ tectoriæ, with holes on the under surface, and also glassy homogeneous masses. The membranes show on microscopic examination often a fine striation; compare among others the description of the pike. The author concludes his description of this fish as follows: "But the closer relation of this membranous formation to the *macula acustica* is very difficult to ascertain, as they are so easily separated from each other. Whether its auditory hairs really enter the holes of the membrane I am unable to determine with certainty, although it seems very probable." In the amphibians we again find the membranæ tectoriæ

Hasse found in the vertebrates, with the exception of the fishes, a closed otolith-sac-membrane,¹ which is formed out of a cuticular mass secreted by the nerve-epithelium and the cells in its vicinity. The otoliths crystallize out of it. The sac-membrane is thickest at the surface facing the epithelium of the macula, and here its structure is like that of the membrana tectoria, or the cupula terminalis of the ampullæ. At its lower surface it is more resistant, and exhibits bell-shaped empty spaces for the reception of the separate auditory hairs. In turtles Hasse saw a striation of the membrane, and in birds a reticular delineation. "The only difference between the covering membrane of the neuroepithelia in the recessus utriculi and on the auditory ledges (*i. e.*, cristæ) consists therefore in this: that in the former crystals of lime are formed in the interior of this cuticular mass, while in the latter the cuticular mass persists as a homogeneous membrane."

Kolliker describes in the sacculus a chalky-white and sharply bounded spot, visible to the naked eye, which is fastened to the inner wall by an entirely transparent, although 0.01''' thick, membrane, perhaps of an epithelial character.²

P. Meyer found in the utriculus of serpents, between the mass of otoliths and the nerve-epithelium, a fibrous, cuticular layer, in which are many holes and clefts; the auditory hairs project into this layer. In the sacculus the crystals of otoliths are held together by an amorphous, mucoid substance.³

upon the maculæ described as thin, glassy, and transparent, striated at the margin, and containing in some parts empty spaces like vacuoles. In the chapter on reptiles we find described an irregular, striated-trabicular substance uniting the disk of otoliths with the macules in the utriculus of the *Lacerta viridis*. In the sacculus of the Alligator Mississip. a covering membrane could not be found by the author. In birds Retzius speaks of "thin covering membranes carrying crystals of otoliths," and describes such a one from the sacculus of the *Columba domestica*, as an extremely delicate, profusely ramified network. The accompanying illustration (fig. 1 on plate xvii.) corresponds almost exactly to the striated formation of the human sacculus, which I shall describe further on.

¹ Anatomische Studien, pp. 220, 278, 464. Supplement to the Anatomischen Studien, p. 80.

² "Gewebelehre," 1855, p. 663.

³ Cited by Retzius. See his "Auditory Organ of the Vertebrates," vol. ii., p. 39.

Kuhn¹ was unable to find upon the macula of the utriculus in the labyrinth of the Chelonians the cuticular mass into which the fine hairs project, described by other authors. He found, however, in the sacculus an uncommonly thin-walled membrane, which enveloped the otolith, and observed in addition, especially in osmium-preparations, on the surface of the macula still another structureless covering mass, which had become hard and yellow through the action of the osmic acid, and in which were innumerable smaller and larger empty spaces. He adds, however, that this mass was absolutely invisible in fresh preparations alongside of the compact, milky-white pulp of the otoliths, and that in cross-sections of hardened objects it never remained in connection with the macula and the otoliths.

Of great significance is, furthermore, Hensen's statement concerning the relations of the otoliths in the fresh sacculus of the gobius.² It read as follows: "It (the great otolith) lies, supported by the hairs, only 0.01 mm distant from the surface of the epithelium, and its relations are such as I have depicted in Fig. 24 in my 'Physiology of the Organ of Hearing,' only the larger stones exhibit no longer an envelope. The cupula-like formations upon the macula acustica described by the author cannot be found."

From the above quotations it will be seen that the majority of the investigators named have found in both of the sacculi of the labyrinth of the vertebrates, between the mass of otoliths and the nerve-epithelium, a more or less soft, unorganized, and, according to Retzius and Hasse, often striated mass into which the auditory hairs projected,—a substance which Hasse formerly identified with the cupulæ of the ampullæ.

Now, if Hensen did not see these cupula-like formations in fresh preparations of the sacculus of the gobius; if Retzius missed the same in the sacculus of the alligator, and Kuhn in the utriculus of the Chelonians, and if the last-named author furthermore assures us that the mass in question is absolutely invisible in fresh preparations of the

¹ Ueber das häutige Labyrinth der Reptilien, pp. 313, 321.

² *Arch. f. Anatomie und Physiologie*, Jahrgang 1878, p. 406.

sacculus of the turtle, and becomes visible only after hardening in osmic acid, then the question, in my opinion, is exactly the same as that with regard to the cupula of the cristæ of the ampullæ—that is, the probability increases, that also the auditory hairs of the macula of living vertebrated animals are surrounded by a clear, transparent, semi-fluid, and, in a fresh condition, invisible substance upon and within which the otolith crystals lie,—a substance which, without, perhaps, possessing an enveloping membrane, is differentiated from the endolymphatic fluid only by a greater degree of concentration, and which, after the death of the animal, congeals either spontaneously or through the action of various reagents, into a soft, firm, unorganized mass, enclosing the auditory hairs, and whose striation is here also caused by the entangled hairs.

A support to this view was furnished by some of my own preparations of the human labyrinth. A distinct striation in the mass enveloping the otolith crystals of the utricle and sacculus, I had already observed in previously made sections, and was reminded by it of the striation of the cupulæ of the ampullæ, from which it differed, however, in the greater breadth of the striæ. In my latest preparations, in which these formations were well fixed by celloidin, I was able to trace distinctly the passage of the hairs into the striæ. The greater breadth of the latter appears to me to be due to the fact that the hairs are here less thickly set than on the cristæ of the ampullæ. In the cupula of the ampullæ the hairs which cause the appearance of striation lie, as is well known, close together, while in the cupula of the sacculi there exists between each two hairs a measurable interval up to 0.007 *mm* in width, which is filled with the coagulated mass. The whole mass differs furthermore from the cupula of the ampullæ in this, that, corresponding to the shorter hairs, it is much lower, and in the preparation it is still lower, as the hairs which at first ascend in a vertical direction, already in the second third of their length bend over and continue thus bent in parallel arched lines for some distance, whereas, on the surface of the structure, on which the otoconia rests,

they end in almost a horizontal direction, thus producing the impression that they are pressed down by the weight of the otolith conglomeratæ. An exact measure of their length can therefore hardly be given. I found them approximately from 0.06 to 0.087 *mm* in length, scarcely one tenth the length of the hairs of the ampullæ. The preparations were stained according to Weigert's method with hæmatoxylin and potassium ferrocyanide, which left the lower portion of the coagulated mass surrounding the source of the hairs clear and transparent, while the upper portion has assumed a yellowish-brown tint. In some of the preparations the hairs cross one another in various directions, whereby net-like figures are produced, the meshes of which, in certain adjustments, might also be interpreted as holes or vacuoles. This appeared to me to be especially the case in sections which were more than $\frac{1}{20}$ *mm* thick.¹ The question as to the nature and consistency of the intermediate substance is of course not alone of interest from a histological point of view, but is also of greatest importance for the solution of physiological problems, and may even deserve consideration for practical reasons. As otologists, we are naturally chiefly interested in the relations of the substance surrounding the auditory hairs in man during life. At present we are still waiting for a decision upon the question

¹ The otoliths, which are of the size stated by Retzius, lie free on the surface of the cupula, but in my preparations there are several layers of these instead of a single layer. The otoliths are oblong hexagonal bodies, with an oval-shaped, lighter, almost transparent portion in the centre, which gives to the smaller of these bodies an appearance of rings in certain adjustments. A distinctly crystalline form cannot be recognized, as is well known, even under higher powers. In the preparations recently made by me I was surprised to find numerous small heaps of otoliths upon the pavement-epithelium of the utricle and the sacculus. The simplest explanation of this would be, of course, that the otoliths became detached from the cupula and were washed here. But as only the smallest, hardly measurable, forms were found here, the thought might also occur that they took their origin not only from the region of the nerve-epithelium, but that the elements of the pavement-epithelium of the sacculi might also produce them. In this connection I beg to draw attention to the peculiar condition of the pavement-epithelium of the endolymphatic spaces described by me in *These ARCHIVES*, vol. x., p. 145. The assumption that the otoliths crystallize out of the cupula of the maculæ is likewise hypothetical, and is connected with the supposition that the otolith-sac-membranes are closed. Rüdinger observed otoliths also in the semicircular canals of man and birds, whose vestibule was uninjured. He expresses no opinion as to the origin of the bodies in question, but says that he does not believe that they were carried there from the utricle.

whether the otoliths serve as mechanical resistencies of the nervous apparatus, or whether they, in conjunction with the intermediate membranes, have the functions of a protecting and damping apparatus. The first view presupposes a certain inertness and insensibility of the terminal apparatus of the auditory nerve, while the latter presumes an opposite state, a very easy excitability. In my opinion, the solution of these enigmas has been made more difficult rather than easier by the otherwise meritorious studies of the organs of the invertebrates, for the tradition that the otoliths act as tetanometers, which is found in all the textbooks on physiology, has not been beneficial to the advancement of our understanding of the physiological procedures in the function of hearing of the higher vertebrates. While Helmholtz¹ finds the otoliths to be in a high degree adapted for exerting a mechanical irritation on the nervous mass with every sudden motion of the water of the labyrinth, Hensen² admits that the structure of the otolith-apparatus and the semicircular canals of the higher animals has as yet furnished no special support to the physiological view.

The function of the large compact otolith of the osseous fishes can only with difficulty be brought in harmony with that of the tiny crystals resting on a glassy mass, and it was perhaps merely for reasons of appropriateness that a greater solidity was claimed for the cupula-formations which unite the otoconia with the maculæ of the sacculi. It was assumed that the auditory hairs projecting into the bell-shaped hollow spaces of this membrane were excited by the movements of the covering membrane. The latter was regarded as functionally equivalent to the compact otoliths of the fishes. Now with regard to the great otoliths of the osseous fishes, especially of the pike, I beg to direct attention to a description given by Max Schultze, in his paper on the mode of termination of the auditory nerve in the labyrinth,³ which, it seems to me, has received but little attention. The author points out the firm immovable

¹ *Lehre von der Tonempfindungen*, p. 287. ² *Physiologie der Gehörs*, p. 102.

³ *J. Müller's Arch. f. Anatomie und Physiologie*, Jahrgang 1858, p. 367.

position of the otolith in the sacculus of the pike, produced by the exact adjustment of the stone to the wall of the sacculus in the vicinity of the macula. For the reception of the macula itself, the otolith possesses however a furrow, which is, however, so deep that it is not entirely filled by the crista. Contact with the nerve-epithelium is thus excluded, and the more so since Schultze was unable to find auditory hairs in the pike. A direct transmission of the oscillations of the otolith to the nerve terminations for the production of a mechanical tetanus in the acoustic nerve is therefore desired, but the possibility is pointed out that under the resonating influence of the otolith, undulations of the fluid may be produced which tetanize the nerve. If I rightly understand the description, the otolith is in this instance to be conceived rather as a covering and protecting apparatus, and there would also be no need for us to place, without further ceremony, the compact otolith of the fishes on the same level with the mobile concrements in the auditory vesicle of the invertebrates. It would be conceivable too that the excitability of the nerves of spinal sense in the animal order increases from below upward, and that the lower animals require strong irritants there when more highly organized creatures are in need of a damping apparatus. Now with regard to the agglomerations of otoliths, Waldeyer¹ is of the opinion that these formations, which remind him of a sandbag are not adapted for being thrown into regular oscillations, but that, on the contrary, they must possess the capacity to dampen the oscillations of other bodies with which they come in contact. This opinion is shared by Landowsky,² who regards the otoliths as mechanical dampers. Finally Hasse³ occupies a middle position, and till lately believed that the cupula terminalis, into whose bell-shaped hollow spaces the auditory hairs project, communicated to the latter the motions of the endolymph, and that essentially the same occurred in the utriculus and sacculus. According to Hasse, these cuticular membranes

¹ Stricker's "Gewebelehre," Bd. ii., p. 952.

² Untersuchungen über den akustischen Endapparat der Säugethiere, *Arch. f. mikroskopische Anatomie*, Bd. xiii., p. 544.

³ Supplement zu den anatomischen Studien, pp. 68, 78, and 81.

have, moreover, at the same time the function of a protecting apparatus against other movements of the endolymph than those caused by sound waves.

Now, if we regard a mechanical commotion of the auditory hairs through the motion of the endolymph an adequate irritation for the terminations of the auditory nerve in the ampullæ and sacculi, and if furthermore it should be established that the auditory hairs in the ampullæ as well as in the sacculi during life are enveloped by a tenacious fluid of greater consistency than the endolymph, then there can be no doubt that this substance restricts the vibrations of the auditory hairs and thus acts as a protecting apparatus and damper. The aggregates of small otolith crystals can at most increase the loading of the hair.

Under the presumption of a gelatinous mass in the region of the cristæ and the maculæ, the question finally attains also practical interest. It will be permissible to conclude that the peripheric excitability of the vestibular nerve must rise or fall the instant the slightest fluctuation occurs in the consistency of the substance enveloping the hairs. It is self-evident that with reference to this point we can entertain only conjectures so long as the function of the nerve-epithelium of the sacculi is shrouded in darkness, and the exact chemical composition of the endolymphatic fluids and the cupula-substances remains unknown. Changes in the consistency of the endolymphatic fluids and in the cupula substances one might expect just as well in chronic passive hyperæmia of the labyrinth as in a hydræmic condition of the blood, following profuse loss of blood and other humors, as, for instance, after childbirth and in leucæmic conditions, and thereby again explain many of Ménière's symptoms dependent on increased irritability of the vestibular nerve, without having constantly recourse to hemorrhages in the labyrinth, to anatomical lesions of the same, or to changes in the central nervous system. An increase in the intracranial pressure, propagation of the same to the perilymphatic fluid, and changes in the relations of the diffusion of the endo- and peri-lymph might here also come into question. The good results obtained in a few

cases of chronic affections of the labyrinth from injections of pilocarpine and courses of cathartics¹—purely empirical procedures having for their object the elimination of large quantities of fluids from the body—may perhaps also be explained on this line, for a resorption of the organized products of inflammation as the result of these procedures will not be expected by any one. On the other hand, the good effect of tonic treatment on subjective noises in the ears, vertigo, and syncope might also be explained with the aid of the above theory.

But be this as it may, I hope to have shown by this communication that the question as to the cupula-formations requires renewed investigations and labor on the part of experts in histology and physiology. May the allusion to the practical therapeutical interest of the question be an incentive to such work.

¹ See Case 6, Jacobson's contribution from Lucæ's clinic, *Arch. f. Ohrenheilk.*, Bd. xxi., p. 287.

REPORT OF A POST-MORTEM EXAMINATION OF THE AUDITORY ORGANS OF A PATIENT WHO DIED OF CEREBRO-SPINAL MENINGITIS.

BY H. STEINBRÜGGE, OF GIESSEN.

(A communication from the Patho-Anatomical Institute at Giessen.)

Translated by DR. JEFFERSON BETTMAN, N. Y.

A. H., a laborer, aged twenty, died of cerebro-spinal meningitis in the hospital at Giessen May 31, 1885. At the time of his admission, May 23d, the patient was already in a comatose state, and his amount of hearing power accordingly could not be determined. Two days prior to his death consciousness partly returned, and the patient appeared to understand questions put to him in a loud voice. This, however, was merely temporary; he soon lapsed into a somnolent state and continued so up to his death. Upon post-mortem examination, the left auditory nerve was found embedded in a yellow creamy exudation. As an involvement of the structure of the labyrinth appeared probable, a detailed examination of the latter, even though no functional examination had been made, was desirable. The main points in the clinical history¹ are as follows:

The patient claims to have been perfectly healthy and able to work up to the evening of May 22d. The following day he complained of great lassitude and malaise and remained in bed. These symptoms increased towards evening, and the patient was brought to the clinic. At time of admission examination showed

¹ The author is indebted to Professors RIEGEL and BOSTRÖM for the material upon which these investigations have been made, as well as for the clinical data and post-mortem report of the case.

him to be of medium size, well-built, much affected by his illness. Skin and face are pale, very hot to the touch. Eyelids are closed; the eye when opened presents a staring expression. The pupils, moderately dilated, react promptly. The tongue is not coated; cavity of mouth is dry. The patient responds to loud questions by merely opening his eyes. Increased carotid pulsations are felt over the neck. Percussion of the well-developed chest reveals no morbid changes in the lungs; on auscultation vesicular breathing is heard everywhere. The area of cardiac dullness is not increased; the apex impulse is distinctly visible and can be felt in the fifth intercostal space in the mammillary line. Abdomen is somewhat prominent, not tender to touch; liver and spleen are not enlarged. Passive movements call forth great tension of the extremities. The patient constantly touches his genitals. The evening temperature is 40.8° ; radial pulse is 60, of moderate tension and easily compressible. Number of respirations 32. Treatment consisted in applications of ice-bags and taking of wine; at night a hypodermic injection of morphia, 0.01, produced rest.

May 24th.—Increasing somnolence with loud cries. Tension in the back of the neck. Hyperæsthesia of the abdomen. Retention of urine necessitating catheterization.

Constipation, notwithstanding calomel had been given in dose 1.25. Profuse sweating. Morning temperature 38.1° , in the evening 37.5° ; pulse 88, 80.

May 25th.—Since yesterday evening increasing strabismus convergens of the right eye; distinct spasmodic flexion of the knees. Stiffness of neck exaggerated. The patient frequently utters loud cries in his sleep. Naso-labial herpes is beginning to develop. Marked injection of the left bulbar conjunctiva. Calomel and infusion of senna produced no evacuation of the bowels. The urine drawn with the catheter showed traces of albumen. Morning temperature, 38.2° ; evening, 38.1° . Pulse, 56; respirations, 84.

May 26th.—Marked vesicular herpes mentalis. The left conjunctival sac contains a small quantity of purulent secretion; slight abrasion or defect of the corneal epithelium. The fundus of the left eye is normal; the arteries in the right eye are slightly contracted; veins turgescient; the optic disc not well defined. Alvine and urinary dejections passed in bed. Morning temperature, 38.5° ; evening, 38.1° . Pulse, 68.

May 27th.—Slight epistaxis; some irritation of the right con-

junctiva. TROUSSEAU's phenomenon can be easily called forth over the entire surface of the skin. Comb-shaped retraction of the abdomen. *The head is constantly deflected toward the left side.* Morning temperature, 38.9° ; evening, 38.2° . Pulse, 72, 88.

May 29th.—Consciousness almost entirely returned during the morning. Superficial bed-sore at the sacrum. Temperature and pulse gradually increased (40.4° and 136 in the evening of the 30th), and death set in the next morning without any unusual symptoms.

Extract from the Report of the Autopsy.

The spinal dura is tense. On dividing it, the arachnoid and pia on the posterior side of the cervical portion of the spinal cord are distinct and whitish in appearance. Veins are very turgid and tortuous. In the dorsal portion and increasing toward the lumbar portion of the spine, these membranes are discolored and purulently infiltrated. The cauda equina and the filarmentum terminale are the parts mostly involved in this infiltration. The membranes covering the anterior surface of the cervical part of the spine are intensely injected; *markedly also the roots of the nerves.* This injection is not as marked in the dorsal portion, and the purulent infiltration is not as profuse in the anterior as in the posterior surface of the lumbar division of the spine. The cord upon section in the level of the second cervical vertebra is soft; the white substance vascular. Lower down to that portion corresponding to the third dorsal vertebra, this soft consistency increases, while the lumbar portion of the cord is much firmer. The calvarium is congested; the dura tensely stretched and vascular. The longitudinal sinus contains a firm blood-clot. The superior face of the soft membranes, more marked on the left side, is very hyperæmic, the veins injected to their terminal ramifications. Posteriorly slight œdema; in some parts a purulent infiltration. On both sides and in the fossæ Sylvii there is a purulent infiltration following the course of the veins. This same condition is noticeable at the base of the brain, more so on the left than on the right side, and in the region of the olfactory nerve. The trifacial, facial, and acoustic nerves appear to be imbedded in pus on the left side of the pons. The brain substance is soft in consistency and hyperæmic. A small abscess filled with greenish pus is found in the white matter of the left lobe. The tissue surrounding it is very much infiltrated and hemorrhagic. The left lobe is less injected.

The posterior cornua contain some purulent fluid. The ependyma of the lateral ventricles is congested.

Macroscopic Condition of the Auditory Organs—Left Temporal Bone.

Hyperæmia of the dura covering it. Small ecchymoses in the neighborhood of the aqueductus vestibuli. The dural pouch of the latter is empty. The sheath of the greater superficial petrosal nerve is very hyperæmic. The venous channels are empty. Only the inferior petrosal sinus contains a small clot of blood adhering to the lower wall. The ext. auditory meatus, the membrane and cavity of the tympanum do not take part in the inflammation. The Eustachian tube contains some mucus. The internal auditory meatus is filled with a cheesy exudation, which does not flow off but adheres firmly to the nerve. The entrance to the aqueduct of the cochlea is filled with the same exudation. This mass of exudation is a direct continuation of that extending from the cranial cavity and enclosing the nerves (9, 10, 11) passing through.

Right Temporal Bone.

The dura mater is less injected than on the left side. The endolymphatic sac is empty, its inner surface smooth and not congested. The neurilemma of the greater superior petrosal nerve is injected. Venous sinuses are empty. The bulbus of the jugular vein and the internal carotid artery contain small blood-clots. The external auditory meatus, drum membrane, and the tympanic cavity are normal. The Eustachian tube is patulous and contains no mucus. The neural sheath in the internal auditory meatus is grayish-red in color; macroscopically presents no trace of any exudation. The aqueduct of the cochlea appears normal.

Microscopic Examination.

Both temporal bones were treated with a one-per-cent. solution of osmic acid, decalcified with a solution of chromic and hydrochloric acids, and then impregnated with celloidin. Beginning at the apex of the pyramid, the sections were made longitudinally to the long axis of the temporal bone. These sections were continued to the base, including in order the cochlea with the internal auditory meatus with its nerve, then the aqueduct of the cochlea, the vestibule, and last of all the semicircular canals. In studying the specimens the object was to get as comprehensive a view as possible of each section of the pyramid. The osseus nuclei remaining

after decalcifying the bones were prepared for section by periodic immersions in a twenty-per-cent. solution of hydrochloric acid and diluted alcohol. Celloidin as an embedding mass protects the labyrinthine structures from the corrosive action of the acid.

Left Labyrinth.

Inner auditory meatus: The vessels of the dura mater are markedly injected. The arachnoidal sheath of the nerves is detached from them and the dura; between it and the trunks of the nerves, also between the nerve fibres, are aggregations of numberless cells. *The facial nerve is affected in a manner similar to the acoustic.* The blood-vessels in all parts, especially those between the bundles of nerve fibres, are intensely injected. At some places extravasations of red blood corpuscles, staining the tissue surrounding the vessels, have taken place. These cells, in the main, have the shape and appearance of ordinary pus corpuscles. Other cells, somewhat larger, measuring on the average 7-24 mikrom. in diameter, containing darkly-stained (osmium), coarsely-granular protoplasm, besides less numerous round hyaline cells of varying size, with highly refracting contours and nuclei irregularly placed, in some near the periphery, in others apparently placed like an excrescence outside of the cell-wall, giving it the appearance of a seal ring, were also noticeable. For brevity's sake these last-mentioned cells will hereafter be alluded to as "ring-cells." *The nerve fibres present no visible changes.*

Aqueduct of the cochlea: In all the transverse sections this structure appears filled with cellular masses. Fortunately two sections of the long diameter of that portion opening into the scala tympani were obtained. In both of these the entrance of the pus into the cochlea was easily and clearly demonstrable. The beginning of the aqueduct was markedly dilated.

The Cochlea.

Scala tympani: The largest infiltration of cells, similar in appearance to those found in the internal auditory meatus, is found in the neighborhood of the opening of the aqueduct of the cochlea. They fill the entire structure, extending to the membrane of the round window, which bulges outward. Smaller aggregations of cells are visible here and there along the margin of the tympanic portion of the spiral ligament. In some sections a hemorrhagic extravasation from the blood-vessels of the spiral ligament is

noticeable. Isolated cells are visible along the margin of the periosteal lining of the scala. At places this lining is raised and fibrillated, the blood-vessels passing between it and the bone being in part exposed. The contents of the vessels appear to be a homogeneous coagulum, no single corpuscles being discernible. The *scala vestibuli* is more or less filled with amorphous masses. They are composed of coagulated exudation, partly granular and in part flaky débris, and a few cellular structures. In a few specimens small cast-off osseous particles are also found.

The *osseous basilar membrane* and the nerves ramifying through it appear unchanged. This notwithstanding the changes affecting the periosteal lining.

Ductus cochlearis: In many of the sections the organ of Corti appeared passably preserved. The series of arches is intact. The inner cells of Corti, even the finer nerve fibres in the tunnel, are frequently recognizable. The outer cells of Corti are not well preserved, appearing small and shrunken. Both Corti's and Reissner's membranes are in the main well preserved. The ductus cochlearis does not contain any foreign cellular structures. The epithelial cells lining the ductus, principally those along the lower surface of Reissner's membrane and those of the stria vascularis, appear swollen, loosened, and in the process of detachment. This condition is most noticeable in the smaller confines of the third turn of the cochlea; the scala tympani of which, also demonstrating the above-mentioned aggregation of flaky débris, appears almost entirely choked up. The layers of tympanic epithelium of the membranous basilar membrane appear denser than normal.

Spiral ligament: The vessels in all parts very much injected, bloody extravasations within and along the margin of the ligament. Between the meshes and in the vicinity of the blood-vessels are accumulations of cells.

Modiolus: Numerous cells, similar to those in the internal auditory meatus, are visible in the vicinity of the bundle of nerve fibres penetrating the modiolus and in the confines of the first turn of the cochlea. Cells are also found in the open spaces in the bone, principally in the neighborhood of the blood-vessels. The vessels are very much injected and in parts surrounded by blood extravasations. No cells are visible between the ganglion cells in the canal of Rosenthal.

Ramus vestibuli: Sections through the lower ampullar branch,

the saccular branch, the utricular branch, and the two branches distributed to the two upper ampullæ and the osseous canals, show everywhere that the neurilemma of these nerves in the beginning of their course is infiltrated with pus cells, in their peripheric portions exclusively by the so-called "ring-cells."

Facial nerve: The spreading of the cell infiltration along this nerve from the internal auditory meatus can be traced almost to the ganglion geniculi. Beyond this point, the sheath of the nerve does not seem to be involved.

Vestibule and Semi-circular Canals.

Sections of the perilymphatic portion of the vestibule present heaping up of detritus mixed with cell structures, a condition similar to that described in the scala vestibuli of the cochlea. Isolated and groups of ring-cells are also noticeable. Excepting a loosening of the epithelia, the walls of the saccules present no marked changes. The nerve-epithelium of the maculæ, the cupulæ and otoliths of which are discernible, also show no changes. The epithelium which normally lines the ligamentous fibres appears to be wanting in places; the spaces thus formed are occupied by adhering ring-cells of varying size. These same shaped cells are very numerous between the nerve fibres and branches of vessels penetrating the maculæ. The ligamentous bands of the ampullæ present the same appearance. Here, also, the cupulæ were mainly preserved and the nerve epithelia of the cristæ and the nerve fibres distributed to them appeared unchanged. Marked destructive changes are visible in the same circular canals. These have most progressed in the upper and posterior canal, while the horizontal canal only represents the beginning or earlier period of the morbid process. Cross-sections of the membranous canal of the latter show it to be normally adherent, the basilar membrane including the papillæ presenting no morbid change. The exterior layer, however, is slightly raised and portions of its lumen filled with cellular detritus. *The periosteal lining of the bony canal is raised in layers by the exudation, the smaller blood-vessels are in part injected, the tissue surrounding them hemorrhagically infiltrated, and in part filled with a yellowish coagulum.* The bony canal, furthermore, contains the same flaky débris, remnants of tissue and ring-cells, as found in the scala vestibuli. These are heaped up along the periosteum projecting into the lumen of the canals, leaving only the centre free. In localized portions of the posterior and upper canals,

and their common outlet, the periosteum is completely stripped off, the bone underlying denuded. The lumen of these canals is filled with a necrotic mass, consisting of coagulated exudation, particles of bone, remains of the fibrous tissue lining the bone, and *fragments of the small, clogged-up periosteal blood-vessels. In many sections no trace of the membranous canal is visible.* In others, it was found *stripped off the bony wall and compressed* in the middle of the osseous canal. They presented varying differences the description of which would lead to a too detailed account. Sections extending generally through the long axis of the aqueduct of the vestibule, showed it to be uniformly dilated. Excepting the presence of some coagulated lymph and a few ring-cells, nothing abnormal was noticeable. The blood-vessels in the interior of the petrous portion of the temporal bone did not seem to be involved.

Right Labyrinth.

To prevent repetition, it can be stated that a condition similar to that existing in the left labyrinth, only in a more modified extent (excluding the condition of the posterior semicircular canal), is found to exist; possibly the destructive process may have begun here at a later period. The internal auditory meatus contains far less cells than that on the left side, and scarcely any are visible in the aqueduct of the cochlea. Correspondingly few pus corpuscles are noticeable in the modiolus and in the scala tympani. Ring-cells are, however, found everywhere, and the scala vestibuli contains the same structureless tissue *débris*, only in less quantity, as described on the left side. This mass extends into the perilymphatic spaces of the vestibule. Excluding the presence of ring-cells between the ligamentous bands, the saccules themselves present no abnormality. The vessels of the right labyrinth are much less injected than those on the left.

Contrary to this, the posterior semicircular canal presented the same destructive changes as that on the left side. The superior and horizontal canals, however, appeared to be in a more initial period of the morbid process, and exhibited changes similar to those detailed on the left side. The aqueduct of the vestibule was not satisfactorily defined. Both aqueducts appeared to be narrower.

REMARKS.

Although no proliferation of the nuclei of the blood-vessels (MERKEL) or thickening of the vascular tunics (HEL-

LER) were observed, the conditions described agree in many respects with the published observations of HELLER, LUCÆ, and MERKEL. I wish, however, to dwell on certain points which seem to me to have an important bearing on the course of the inflammatory process, and, moreover, relate to the actual origin of the destructive changes in the ear. There is little doubt that in this case the pus gained access from the cranial cavity through the left aqueduct of the cochlea, penetrated into the scala tympani of the cochlea, and travelled also along the first thick branch of the nervus cochleæ into the base of the modiolus. Perhaps the right side was exclusively affected in the last manner. In referring to the penetration of pus into the modiolus, we must however remark that this condition was only clearly demonstrated in the first turn of the cochlea. The finer the dividing branches of the cochlear nerve running toward the apex of the modiolus, the less space do their osseous canals offer for the penetration of cellular structures. The intact state of the ganglion cells in Rosenthal's canal, arranged so compactly one against the other, finally impress me as not favoring the passage of pus corpuscles. Assuming, in any case, that the pus gained access to the scalæ of the cochlea alone by way of the nerve, it necessarily had to pass through the layer of ganglia, penetrate through the fine canals of the lamina spiralis ossea, and finally through the perforations of the zona perforata to arrive in the ductus cochlearis. As no pus was found in the ductus cochlearis, in fact in none of the endolymphatic spaces, this in itself improbable occurrence may safely be excluded in the case under discussion. Contrarily, it can easily be seen that the passage of pus along the bundle of nerve fibres to the base of the modiolus will readily explain its penetration into the numerous spaces and fissures of the loose tissue of the modiolus, its presence in the perivascular spaces of the vessels, thus disseminating the inflammation. As part of the open spaces of the modiolus are separated from the scalæ of the cochlea only by a thin periosteal partition, it is possible that pus corpuscles may penetrate into the scalæ through the tissue meshes of this membrane.

Considering the *quantity* of pus entering from the cranial cavity, and its *rapid* dissemination in all the labyrinthian cavities by means of the perilymph, this manner of migration seems less probable than that by way of the aqueduct of the cochlea.

Irrespective of the pus penetrating from the cranial cavity, the formation of pus in the labyrinth may be looked upon as a product of an extension of the inflammation, *i. e.*, by diapedesis of white blood corpuscles and proliferation of the fixed connective-tissue cells. Further on we shall allude to this point, and merely state here that there was no indication of a marked increase of *genuine* pus cells,¹ and that the amount of pus found was out of proportion to the already fully developed destructive changes. Independent of a possible disturbance of function, which, in the case, may, to a certain extent, be explained mechanically by the collection of pus in the scala tympani and subsequent pressure upon the membrane of the round window, the presence of pus in the labyrinth attracts our interest and gives rise to the question: Are the pus corpuscles the bearers of the distinctive virus of the disease?

Deducting from observations in other infectious diseases, it is highly probable that cerebro-spinal meningitis also has its characteristic infective agent. LEICHTENSTERN² has lately demonstrated small spherical cocci, some isolated, others arranged in small irregular groups, mostly enclosed in white blood corpuscles, *but also existing outside of the cell*, in the exudation on the pia of a person who died of cerebro-spinal meningitis. The possibility, accordingly, is worthy of consideration, that some of the cocci, by virtue of their diminutive size penetrating everywhere easier than pus cells, may have entered the labyrinth with cerebral fluid earlier than the pus, and here disseminated the inflammation. In our case, the facts that the inflammatory process appeared to be less in degree in the modiolus and scala tympani—the first points exposed to the invading pus—

¹ The ring-cells are not included in this species.

² Report of the allgem. ärztl. Verein of Cologne, session of March 16, 1885. *Deutsche med. Wochenschr.*, No. 23, 1885.

than higher up in the semicircular canals, furthermore that no real pus cells (ring-cells are not included) were found in the latter, would favor the view of an early and independent migration, followed by rapid increase and spread of the cocci. It must further be stated that but little pus was found in the right labyrinth, although the destructive changes in the posterior semicircular canal had already quite progressed. Since the type and characteristics of this specific germ have not yet been firmly determined, the decision of the point in question is irrelevant and impossible. We merely call attention to this point, as the presence of pus cells in the labyrinth and the attempts to explain its manner of travel from the cranial cavity will naturally lose its weight as soon as it has been firmly established that cerebro-spinal meningitis is caused by a specific virus, that the pus cells are the means of absorbing and disseminating it,¹ the pus corpuscles themselves not representing the real feature of the morbid process. In dwelling upon the cellular structures found in the internal auditory meatus, besides the preponderating number of pus cells, larger round cells with coarsely granular, partly black-stained contents were also observed. I am undecided whether these last cells arise from the confluence of pus corpuscles (called epitheloid cells by COHNHEIM), whether the black staining by osmic acid indicates a beginning fatty degeneration of the cell contents, namely a retrogressive metamorphosis, and whether the granules, resembling nuclei and nucleoli, have any relation to the organized virus (germs) of the disease. It will require the examination of fresher material by an expert with the use of modern staining methods to decide this. My explanation of the origin of the ring-cells is as follows: The fibrous trabeculæ, which partly constitute the arachnoidal sheath of the nerves of the internal auditory meatus, are lined with cells containing a small oval nucleus. Cells almost similar are found on the ligamentous bands of the saccules, ampullæ, and semicircular canals, the so-called

¹ This is not the place to discuss the hypothesis that the pus cells absorb, and by a process of digestion destroy, the infectious organisms, according to which suppuration may be regarded as favoring restitution.

ligamenta labyrinthi of RÜDINGER. The nuclei of these cells stand out prominently, while the protoplasm itself is so delicate as barely to define the contours of the individual cell. In consequence of the inflammatory irritation (nutritive, according to VIRCHOW) these cells swell up and become detached from the fibrous framework.

Although the nucleus itself remains unchanged, the body of the cell becomes more or less distended and assumes a globular shape; a change similar to that observed in the cube-shaped cells in inflammatory processes of the respiratory mucous membrane. The unaltered nucleus adhering to the periphery of the distended cell imparts to the whole the appearance of a ring. No segmentation of the nucleus or proliferation of the cells consequent upon the inflammatory irritation was noticeable; it was rare to find two nuclei within one cell. The detachment of these cells and their presence in great numbers in various parts of the labyrinth, moreover, would indicate, that these structures do not develop but degenerate and form a portion of the detritus. The fact, that they were also observed in all the transverse sections of the bony canals containing the branches of the vestibular nerves, even in parts where pus cells had not penetrated, lends additional interest to these cells. Otherwise, it may have been assumed that these cells were identical with pus cells, and migrated from the internal auditory meatus. In general, the detachment of these cells is of minor importance. *The changes in the periosteum,¹ the perilymphatic spaces, and those most marked in the semicircular canals, impress me as interfering essentially with the integrity of the sense organ.*

According to COHNHEIM's theory,² the course of the inflammation may be explained as follows:

The small, ramifying vessels between the bone and its periosteal covering are acted upon most intensely by the specific virus of the disease.

In consequence of the subsequent changes in the tunics

¹ For brevity's sake, I call the fibrous, epithelial-bearing lining of the bony labyrinthine spaces periosteum.

² See Vorlesungen über allgem. Pathologie, p. 271 and 272.

and dilatation of the vessels, the current of blood is retarded. The beginning of the inflammation, or light forms of it, are marked by a fibrinous exudation. This produces a splitting up of the periosteum into layers and denudation of the bone. The passage of *white* blood corpuscles from the blood-vessels does not seem to take place. The inflammation increasing, stagnation of the blood in the vessels takes place, and is followed in places by escape of red blood corpuscles. In the severest types of inflammation, complete stasis ensues, the vessels are choked up, and *necrosis* follows. The periosteal layer and superficial lamellæ of bone become detached, and combining with fragments of thrombosed vessels, cell detritus, and coagulated exudation, form a mass of *débris*, filling up more or less the bony semicircular canal.

Nowhere were there traces of a productive inflammation; the appearance of one case was merely that of the severest type of inflammation and inflammatory necrosis.¹

The fibrous ligaments directly attached to the periosteum of the labyrinthian cavities *convey the nutrient vessels to the semicircular canals, the ampullæ, and saccules*. Stasis also affects these vessels, and *the progress of the necrosing inflammation necessarily must lead to detachment and destruction of the membranous structures of the labyrinth*. This will readily explain the detachment, disintegration, and disappearance of the membranous semicircular canals. The ampullæ and saccules are better preserved; the changes in the periosteum, probably due to a more favorable circulatory arrangement, not having progressed so far. We intentionally call no attention to partial defects in the ligamentary bands, to variations in shape of transverse sections of the ampullæ visible in some cuts, as these changes may have been caused by the processes of decalcifying or rough handling in preparing the specimens. In dwelling upon the detritus in the vestibule and scala vestibuli, it must be considered that the periosteal lining of these parts was not sufficiently involved to *locally explain* its presence. It must

¹ According to *Cohnheim* "the organized viruses of the various infectious diseases resemble that of pharyngeal diphtheria in calling forth inflammatory necrotic processes wherever deposited" (diphtheroid processes according to *Weigert*), *l. c.*, p. 484.

be assumed that the greater part of it was formed in the semicircular canals, and by means of the perilymphatic fluid deposited in the vestibule and cochlea. It cannot be doubted that a continuance of the necrotic inflammation would eventually have led to a similar detachment and destruction of the endolymphatic structures of the vestibule and cochlea. It is also possible that the circulatory arrangement of the periosteum of the cochlea differs from that of the semicircular canals. Be it as it may, the changes described in the cochlea, *i. e.*, hyperæmia and hemorrhagic extravasation into the ligamentum spirale, the presence of cells within its fibrous meshes, of pus and detritus in the scalæ, the changes thus occasioned in the consistency and chemical condition of the peri- and endo-lymphatic fluid, finally the detachment of the epithelial layer lining the ductus cochlearis, are assuredly within themselves sufficient to produce great functional disturbances of the delicate minute nerve terminations. Considering our present methods of examination, our imperfect knowledge of these parts in a normal condition, it is impossible to state whether or not the cells of the organ of Corti, and the delicate nerve fibrillæ distributed to them, were involved. The same must be said of the nerve-epithelia of the ampullæ and saccules, which are difficult to define in normal conditions. The fact that the structures of the cupula were mainly preserved, would indicate that cell changes had as yet not occurred. The cellular detritus observed in the left horizontal membranous canal probably originated from the detached and degenerated cells lining it. Similar to the ductus cochlearis and the ligaments of the labyrinth, the inflammation seems to have produced cloudy swelling and detachment of the epithelia.

It is far from my intentions to draw general deductions from the examination of a single case. If future observations will corroborate the changes as described in the semicircular canals, it will be very easy to explain the rapidity with which the auditory organ is destroyed in sporadic cases of cerebro-spinal meningitis, and further, the hopelessness of a cure. I further wish to dwell upon the ques-

tion frequently discussed, the condition of the facial nerve and its participation in the inflammatory process. Although in the case under discussion, the facial nerve in the internal auditory meatus, and for some distance in its horizontal portion, was bathed in pus and its vessels turgid (similar to LUCÆ'S case and one of the two cases described by HELLER), the clinical history does not mention any paralysis of the muscles supplied by it. The case may offer an additional example of the special resistance of the facial nerve in meningitic exudations. MOOS¹ has already emphasized the fact, "that in consequence of the violent course of the disease and the constant soporous state of the patient, symptoms indicating complication of other nerves (in referring to the acoustic) may not be manifested." On the other hand, the following assumption is worthy of consideration, and explains very simply the variation in the condition of the acoustic and facial nerves: Great changes or destruction of the labyrinthine structures consequent upon inflammation, will readily account for the ensuing deafness without necessitating impairment of function of the trunk of the acoustic nerve. The fact, exemplified in many cases, that the patients surviving the attack of meningitis recover entirely, excepting frequent resulting deafness and disturbances of equilibrium, demonstrates that the exudation within the cranial cavity and surrounding the nerves has been entirely absorbed. According to my view, this process of restitution may affect *the trunk* of the acoustic nerve as well as the facial and other nerves, notwithstanding existing deafness. Numerous cases of subjective tinnitus show conclusively, recognizing the labyrinthine deafness, that the acoustic nerve is not always paralyzed. This does not exclude the possibility of a *secondary* degeneration of its fibres due to cicatricial contraction of the neurilemma or lack of function. There is no reason, however, to assume that these cases are more numerous than those of facial paralysis. These last mentioned do occur now and then,² and although ZIEMSEN himself was not able to

¹ Ueber Meningitis cerebr.-spin. epidemica, p. 17.

² Comp. Seggel, bayr. Intelligenzblatt, 1865, No. 46, p. 644. Quoted from Moos, *l. c.*, p. 17.

observe any disturbances of facial-nerve innervation in his own cases, he quotes several others.

Considering the symptoms, at least those in the first stage of the disease, which clearly point to an irritation rather than paralysis of the nerve, it appears that the presence of symptoms of paralysis have been too generally preconceived. Such irritation of the higher sensory nerves is generally manifested by sensitiveness to light and noises¹ and subjective auditory impressions; in motor nerves, by clonic or tonic spasms. ZIEMSEN speaks of *unilateral or bilateral facial spasm*, which I attribute to irritation of the fibres of the facial nerve. The involvement of this nerve in the inflammation, being indicated merely by transitory spasmodic contraction of the facial muscles, may either be overlooked or the latter symptoms be attributed to irritation of the cerebral cortex.

Nystagmus, a series of clonic spasms, strabismus, produced by tonic contractions of the ocular muscles (paralysis of the antagonistic muscles need not necessarily always exist), and contraction of the pupil further serve as indications of increased irritation of the motor nerves. In the case under discussion constant deflection of the head toward the left side was also noted, and as the left vagus nerve was found to be surrounded by pus at the autopsy, this symptom may be attributed to irritation of the left accessory nerve. It also may be assumed that only *some of the nerve fibres* were involved, the others escaping. This will easier explain the involvement of isolated muscles or sets of muscles, than a presumptive affection of the cortex of the brain or other portions of the central nervous organ. Irritation of the trifacial nerve was made manifest by the herpetic eruption, and also possibly by the conjunctivitis (involvement of the trophic nerves?). In considering the

¹ Coinciding with LUCAS that in similar cases (a case of caries, communicated at the Strassburger Naturforscher-Versammlung) the wave sounds in bone-conduction directly impinge upon the trunk of the acoustic, its conducting function being unimpaired, and thus creating auditory impressions, it is possible that, notwithstanding the deafness or impaired hearing after disease of the labyrinth, sensitiveness to sounds and noises may still remain. Consequently we should be more conservative in the use of the term "nervous deafness," and ere applying the same, clearly demonstrate to what *portion* of the nervous tract we are alluding.

extension of the purulent inflammation to the neurilemma of the spinal nerve-roots, a process probably similar to that of the cranial nerves, the familiar contraction of the neck, opisthotonus, general hyperæsthesia of the skin and the joints, erythema, and urticaria eruption, are all expressions of direct irritations of the nerves. Besides spasmodic contraction of the neck, spasmodic flexion of both knees was noted in the case under observation.

Also in those cases of cerebro-spinal meningitis terminating in recovery, purulent infiltration of the neurilemma of the trunk of the nerves may accordingly have existed. Owing to the gravity of the disease, this condition may have called forth no symptoms or merely have expressed itself in those of nerve-irritation. Only in few cases, and then secondarily, does this lead to paralysis. *As the terminal apparatus of the acoustic is affected frequently, its trunk, however, not more often than that of the facial during the course of the cerebro-spinal meningitis, any variation regarding the involvement of either is only apparent.*

ON THE MECHANISM OF CHRONIC PURULENT MYRINGITIS IN TUBERCULOUS INDIVIDUALS.*

BY PROF. S. MOOS, OF HEIDELBERG.

(With plates ix. and x., of vol. xv., *Germ. ed.*)

Translated by A. SCHAPRINGER, M.D., of New York.

IN the present paper I do not propose to treat of the action of bacilli in the myringitis of tuberculous individuals. As it happened, the specimens which form the basis of this investigation were all derived from patients affected with tuberculosis. It appeared to me necessary to mention this in the title of this paper in order to prevent misunderstanding, since it is possible that the mechanism of purulent myringitis accompanying or caused by other morbid conditions than tuberculosis, if investigated, may prove different from the one here described.

I.—*The Changes in the Malpighian Layer.*

The morbid changes of the Malpighian layer in chronic purulent myringitis have not been accurately described as yet. Under a strong magnifying power the cells composing this layer present the appearance of increased activity. Many of the nuclei appear to be very rich in protoplasm and so swollen as almost to reach the cell walls. The proliferation of the *rete Malpighi* due to this increased activity is of a threefold character:

1. There are *irregular hyperplasiæ* in the direction of the cuticular layer, showing often a diameter four or five times as large as that of the normal Malpighian layer.

* Read before the Section on Otology in the Convention of German Naturalists and Physicians held at Strasburg, 1885.

2. The proliferation also forms true *papillæ* (v. fig. 4, at *p*), with loops of blood-vessels between them. They are often so numerous as to extend over the entire half of a section of the membrana tympani. In the normal condition such *papillæ* are not found in the drum membrane at all, but in its neighborhood.

3. There are large and broad hyperplasiæ reaching as far as the manubrial artery, which, on cross section, present the appearance of plugs or clubs (v. fig. 1, *z*, and fig. 2).

This proliferation does not only take place in a transverse but also in a vertical direction. Hence we find often islands of proliferated Malpighian tissue within the cuticular layer (fig. 1, and fig. 7, *z*) having no connection with the main layer immediately underneath the epidermis. This is important to note, since these islands can become the seats of cholesteatomatous degeneration. In such a case a primary cholesteatomawould be found in the midst of the cuticular layer the origin of which would have to be explained as above, and would be something different from the endothelial cholesteatoma of the drum membrane as described by Wendt.

Sometimes a row of spindle-shaped cells is found at the bottom of the Malpighian stratum with their axes directed toward the epidermis (fig. 3, *sp*). These may be derived either from the Malpighian stratum by the process of indirect nuclear segmentation, or, as to me seems more probable, from wandering cells of the inflamed cutis which have assumed the shape of spindles.

All the different changes of the Malpighian layer here described may be found in one and the same subject, except the spindle-shaped cells, which I have found in cross-sections of the membrana flaccida only.

II.—*The Changes of the Cuticular Layer.*

The histological elements of the cuticular layer are displaced to some extent by the above-described plug-shaped proliferations of the Malpighian layer. Wherever it is not so displaced, it presents the following appearances:

The normal blood-vessels are mostly dilated and gorged

with blood corpuscles. There are besides numerous newly formed blood-vessels, especially in the membrana flaccida, which, as is well known, not only possesses a vascular net of its own, but also many perforating arteries and veins—the former supplying nutrition to the adjacent mucous membrane and the neck of the hammer, and the latter carrying off the blood of a part of the tympanic cavity to the manubrial veins in the cuticular layer. For this reason the membrana flaccida presents a truly cavernous appearance in several places. The neighborhood of the external wall of the vessels is more or less infiltrated with round cells, and the interstices of the cuticular connective tissue are studded with round, multinuclear and pus cells.

The newly formed connective tissue, also to be found, is the product partly of round cells which have been transformed into spindle cells, and partly of the proliferation of the mural elements of the blood-vessels. At a certain stage of purulent inflammation these cells coalesce, and the resulting connective-tissue hyperplasia causes the obliteration of the normal as well as the new-formed blood-vessels. (Thickening of the cuticular layer of the drum membrane, fig. 3, *cs.*)

The inflammatory changes of the cuticular layer here described extend into the wall of the external auditory canal for several millimetres. For this reason the limits of the membrana tympani become blurred, and the membrane itself, when examined by the speculum, appears flattened and smaller.

Besides these products of proliferation, which in some instances were found to be most pronounced in the membrana flaccida, there are also to be met with the results of *destructive changes*, especially in the portion of the cuticular layer corresponding to the handle of the hammer. In this region, which is the most vascular of the cuticular layer, the purulent infiltration is most pronounced, causing the destruction not only of the cuticular layer itself, but also of the adjacent periosteal layer of the handle. In consequence of this all the layers of the drum membrane covering the lateral aspect of the handle disappear, leaving bare the carious bone (fig. 1 and figs. 6 and 7, *chg.*).

III.—*The Changes of the Mucous Membrane.*

The inflammatory changes of the mucous membrane and the tissue hyperplasia caused by them, on the whole, differ only little from those found in the cuticular layer. Besides the enlargement of the normal blood-vessels, new-formed vessels are to be found engorged with blood. The connective-tissue stroma of the mucous membrane is studded with round and pus cells. This formation of cells is sometimes so abundant that in some well-preserved cross-sections a broad zone of products of exudation can be seen clinging to the epithelial surface of the mucous membrane. As a rule, the hyperplasia of the mucous membrane is most pronounced in the region of the handle and at the inner surface of the ventricular ligament. At the latter place the infiltration is often so exuberant as to completely fill the ventricle. New-formation of connective tissue is not met with so often, and to such an extent, in the mucous layer as in the cuticular layer. Beginnings of newly-formed connective tissue are sometimes seen at the inner surface of the ventricular ligament (fig. 5). This forms the preliminary stage of the subsequent obliteration of the ventricle by new-formation of connective tissue.

In a previous paper on lacunar caries of the handle of the hammer I have demonstrated that the mucous membrane in the region of the handle, the deeper layers of which form the latter's periosteum, may be undermined and become detached by purulent destruction, and that by the formation and subsequent increase of granulation tissue at the inner surface of the mucous membrane caries of the handle will result. This process is met with very often in purulent myringitis of tuberculous subjects, and as the same process may also take place on the lateral side, as described above, the carious destruction of the handle will reach its maximum at the point where the destructive process attacking the bone from opposite sides, will meet.

This does not exclude a simultaneous proliferation and thickening of the periosteum of the handle. While carious destruction is going on, on both the medial and the lateral side, periostitis may flourish on both the anterior and posterior edges of the manubrium (fig. 6, *vp*).

IV.—*The Changes of the Substantia Propria.*

Besides those changes which concern the *substantia propria* as far as it helps to form the manubrial periosteum and which have been described before, there are also other changes which are more of a passive nature and are due to the mechanical influence of the inflamed and infiltrated layers covering the *substantia propria*. I have never been able to find *true vascular inflammation* of the *substantia propria* in the myringitis occurring in tuberculous individuals. The blood-vessels perforating the *substantia propria*, which have been described by Kessel and myself, seem to simply keep their character as blood conduits without taking any active part at all in the inflammatory process. They are more or less filled with blood, show no histological changes of their walls, nor is there any perivascular small-celled or purulent infiltration. Nor does the purulent infiltration of other portions of the *substantia propria* ever reach such a degree as in the cuticular and mucous layers except in some places immediately adjoining these layers. As a rule, the *substantia propria* suffers angular and arched displacements in consequence of the pressure of the enormous mass of exudation (figs. 1 and 7).¹ If this pressure increase still more, the *substantia propria* will be ruptured by the forcible displacement of its fibres, which, instead of following a transverse direction, will be found to run obliquely and, by this circumstance, reminding one of the smooth muscular fibres which Leydig found in the drum membrane of the frog (figs. 1 and 7).

In other places the *substantia propria* becomes ruptured less by pressure than in consequence of the swelling and maceration of its own tissue, its fibres being displaced in a transverse direction (fig. 5).

Though it is possible that these two processes may co-exist, I have never had an opportunity to observe such a combination.

Whenever the *substantia propria* is ruptured hemorrhage takes place, the results of which can be found in the meshes

¹ After the subsidence of the inflammation the corresponding places, when examined with the ear-speculum, will appear as irregular, partial opacities.

of the thickened connective tissue of the cuticular layer (compare fig. 1).

This hemorrhage may also take place into the mucous tissue or into the tympanic cavity itself, or into both at once, but I do not have any specimens demonstrating these possibilities.

Hemorrhagic Infiltration and Hemorrhagic Inflammation
(compare fig. 5).

Hemorrhagic infiltration has to be distinguished from the hemorrhagic effusion into the interstices of the cuticular tissue as described above. The hemorrhagic infiltration may either be circumscribed or diffuse. The latter form may comprise the whole specimen under investigation, even including the carious lacunæ of the handle. In order to properly understand the mechanism of its causation, we must study the normal condition of the blood circulation in the drum membrane.

There are certainly few areas supplied by blood-vessels in the human system or in that of animals which present such an abundance of capillary anastomoses as the *membrana tympani*.¹

These favor rapid equalization of disturbances of circulation, which is also favored by the arrangement of the venous blood-channels in the several layers of the membrane as described in the paper just quoted. If the drum membrane becomes inflamed, the rupture of the walls of blood-vessels will be delayed long by reason of the presence of these capillary anastomoses. However, if the inflammatory process is of long duration or of a very severe character, this automatic safety-apparatus becomes insufficient, there is a general breaking down of the walls of the over-distended blood-vessels, old and new, diffuse hemorrhage takes place, and instead of a purulent we have a hemorrhagic inflammation. In some severe cases of otitis media this process takes place during the first stages of the disease, constituting considerable hemorrhage. D. B. St. John

¹ On the Blood-vessels and the Circulation in the *Membrana Tympani* and the *Manubrium Mallei*. These ARCHIVES, vol. vi., p. 574.

Roosa ("Diseases of the Ear") has described this affection as *otitis media hæmorrhagica*. He thinks that it is due more to rupture of the blood-vessels than to exudative processes, in which opinion I cannot coincide, because if it were so the hemorrhage would be the only symptom, whereas the processes of exudation are never wanting, though sometimes they are of short duration only. This shortness of duration is due to the fact that nature relieved the parts by bleeding in a more effectual manner than it could ever be accomplished by artificial means. A copious hemorrhage in the beginning of acute purulent otitis media ought therefore always to be regarded as a favorable symptom.

Synopsis of Measurements Made of the Single Layers of the Drum Membrane in a State of Acute Purulent Inflammation.

Thickness of the mucous membrane from 0.4 to 0.5 mm; thickness of the cuticular layer from 0.13 to 0.16 or 0.2 mm; thickness of rete Malpighi, 0.3 (normal) to 0.19 mm; thickness of membrana propria, average of five measurements (0.07, 0.05, 0.01, 0.02, 0.03 mm), 0.036 mm; thickness of cuticular layer of membrana flaccida, 0.65 to 0.75 mm; thickness of hemorrhagic infiltration in the posterior pocket, 0.436 to 0.545 mm; thickness of thickened cuticular layer in later stages of inflammation, 0.1 to 0.2 mm.

The greatest increase in thickness is shown by the membrana flaccida, the mucous membrane coming next. The variations in the thickness of the membrana propria depend upon whether it happens to be intact or in a stage of swelling and maceration. The variations in the thickness of the rete mucosum depend upon the degree of inflammation participated in by its component cells.

Explanation of Plates ix. and x.

Fig. 1. Section across the middle of the hammer and the adjacent parts of the drum membrane (Hartnack $\frac{3}{4}$, tube at zero) of a man twenty years old who died of chronic tuberculosis and who had suffered from otitis media purulenta of the right ear for five months preceding his death. The perforation was in front of the

handle which was drawn towards the promontory. The grayish-red remnant of the drum membrane was seen during life to be thickened. S = mucous membrane with several blood-vessels, thickened, in parts considerably so, by small-celled and purulent infiltration. p = membrana propria and periosteum. T'' = a portion of the posterior half of the membrana tympani, from two to three times as wide as T = the neighborhood of the perforation. The large dark portion adjoining T represents the handle of the hammer which is carious on its lateral side. The carious part which is characterized by being made to appear light in the drawing and by sinuous contours, consists of vascular granulation tissue. The arrow (\rightarrow) points in a lateral direction, *i.e.* towards the external auditory canal. The lateral surface of the handle is denuded, all the layers of the drum membrane including the periosteum having been destroyed by suppuration. There where the layers are still preserved (T'') they present the following changes: The mucous membrane is thickened by infiltration, though less so than in the region of the handle. The membrana propria (p) shows normal width and structure for some distance, but there where the yellow hemorrhagic lacunæ appear, its fibres are thrust asunder. The cuticular layer is moderately vascular and shows small-celled and purulent infiltration as well as connective-tissue hyperplasia. From the rete Malpighi club-shaped extensions (z) are invading the cuticular layer, as far as the manubrial artery (ha).

Fig. 2 shows the structure of the club-shaped extensions of the rete Malpighi under a higher magnifying power (Hartnack $\frac{3}{4}$, tube at zero).

Fig. 3. A small portion of a section taken from the region of the membrana flaccida and comprising the epidermis (e), the rete Malpighi (rm) and the adjacent portion of the thickened cuticular layer (Hartnack $\frac{3}{4}$, tube drawn out). The cells of the rete mucosum are somewhat increased in number, and their nuclei, which are rich in protoplasm, almost reach to the cell wall. A single row of spindle cells (sp) with their large diameter looking towards the epidermis, is placed between the deepest row of Malpighian cells and the most superficial elements of the cuticular layer (cs). This layer has lost a great deal of its vascular supply, and consists mainly of connective tissue, the rest being made up of uninuclear and a few multinuclear cells (vz).

Fig. 4. A portion of a section of the membrana flaccida in a

state of chronic purulent inflammation (Hartnack $\frac{3}{4}$, tube at zero). The epidermic layer (*e*) is narrow, the rete Malpighi is developed into veritable papillæ (*p*), with loops of blood-vessels supplied from the cuticular layer (*c s*) between them. Only one third of the thickness of the hyperplastic cuticular layer is represented in the drawing. It is infiltrated by round and pus cells, and pervaded by blood-vessels, partly empty and partly filled with blood corpuscles.

Fig. 5. A portion of a section through the drum membrane and the posterior ventricular ligament (Hartnack $\frac{3}{4}$, tube at zero). Chronic purulent myringitis. *S* = mucous membrane. *tb* = ventricular ligament. *mp* = membrana propria. *cs* = cuticular layer. *erm* = epidermis and rete Malpighi. *a* = an artery of the cuticular layer. The mucous membrane, which is considerably thickened in some places, and the cuticular layer are permeated by dilated vessels and exhibit hemorrhagic infiltration, the mucous membrane in its entirety and the cuticular layer only in portions. At the inner surface of the ventricular ligament (at the left side of the drawing) there are strings of newly formed connective tissue, indicating a preliminary stage of the obliteration of the pouch. At the right side of the drawing the fibres of the ligament are separated from each other and displaced in a transverse direction.

Fig. 6. Lateral caries of the handle and periostitis of its anterior edge. Transverse section of the handle and the tympanic membrane, as in fig. 1 (Hartnack $\frac{3}{4}$, tube drawn out). *chg* = carious handle of the hammer. *gw* = granulation tissue showing hemorrhagic infiltration. A portion of the handle and the lateral aspect of the adjacent parts of the drum membrane have been destroyed. The arrow (\rightarrow) points away from the medial side. *S* = thickened mucous membrane with hemorrhagic infiltration. *vp* = thickened periosteum. *mpp* = membrana propria, in connection with the periosteum, which in this place is intact. At *x* the membrana propria is broken through and displaced by masses of infiltration. *a* = an artery of the cuticular layer. Between the fibres of the thickened periosteum there are numerous blood-vessels with hemorrhagic infiltration of their neighborhood.

Fig. 7. A cross-section of the carious end of the hammer and the adjacent membrana tympani (chronic purulent inflammation) (Hartnack $\frac{3}{4}$, tube drawn out). The arrow (\rightarrow) points in a medial direction. *chg* = carious handle. *gw* = granulation

tissue. *S* = mucous membrane, thickened and exhibiting hemorrhagic infiltration. *mp* = membrana propria, displaced in a lateral direction and showing sinuities and angular curves. *erp* = epidermis and rete Malpighi, with the plug-shaped projections of the latter into the subjacent tissue. *cs* = vascular and infiltrated cuticular layer, partly pervaded by hyperplastic connective tissue. *a* = an artery of the cuticular layer. *z* = transverse section of a Malpighian plug.

ON CYSTS OF THE AURICLE.

By H. SELIGMANN, OF FRANKFORT-ON-THE-MAIN.

Translated by A. SCHAPRINGER, M.D., of New York.

THE observations on formation of cysts in the auricle, published by Hartmann, in the last volume of these ARCHIVES (p. 133), have induced me to publish the following case, which tends to corroborate this author's view concerning the difference between the formation of cysts and that of hæmatoma.

Herr W., æt. thirty-five, of robust and florid appearance, wearing a full blonde beard, and with sound intellect, applied to me on May 23, 1885, on account of a swelling of two months' duration, occupying the usual situation of othæmatoma between the upper portions of the helix and the anthelix of the right ear. The skin was very tense and somewhat hot. The swelling itself had the size of a walnut, was round, tense, smooth, and not tender to the touch. The rest of the cartilage was normal. Traumatism could be positively excluded. The patient not consenting to an incision, I tapped the swelling by means of a Pravaz syringe, and evacuated about 3 *ccm* of a thick, transparent fluid of a light-yellow color. The place of the puncture was covered with a piece of adhesive plaster, and the pinna being padded with cotton, a bandage was applied.

The patient did not put in appearance a second time, but through a friend of his I learned, about five months later, that a little of the fluid had collected again after the puncture, but that it disappeared again, and that the ear now presented the same appearance as the other.

The morphological elements contained in the liquid were some

mucous threads, some white and very few red blood corpuscles. There was no trace of any products of the disintegration of red blood corpuscles. This circumstance, taken in connection with the absence of traumatism and of pain, and the intact general health of the patient, leaves no doubt that this was not a case of othæmatoma, but of cyst.

In regard to the treatment, I would say that in the next case I would first try multiple puncture, and incise only in case this should fail to cure. Massage and a compressive bandage would be connected with more inconvenience than the slight discomfort of the patient would warrant.

REPORT ON THE PROGRESS OF OTOTOLOGY IN THE FIRST HALF OF THE YEAR 1886.

I.—NORMAL AND PATHOLOGICAL ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE EAR AND NASO-PHARYNX.

BY A. BARTH, OF BERLIN.

Translated by Dr. JEFFERSON BETTMAN, New York.

ANATOMY OF THE EAR.

1. Dr. EM. KAUFMANN, of Prague. Annular ridges in the cutis of the external auditory meatus (communication from the laboratory of Prof. Schenk in Vienna); 1 plate. *Wiener med. Jahrb.*, 1886, Heft 5, p. 201.

2. VOLTOLINI. A study of the auditory teeth and their blood-vessels in the cochleæ of human beings and mammals. *Virchow's Arch.*, Bd. civ., p. 109.

3. Dr. BENNO BAGINSKY, Docent in Berlin. The origin and central course of the acoustic nerve in rabbits; 1 plate. *Virchow's Arch.*, Bd. cv., pag. 28 (July 3, 1886).

4. Dr. EDINGER, of Frankfurt. The origin of the acoustic nerve and the direct sensory cerebellar tract. *Neurolog. Centralbl.*, 1886, pag. 286.

1. Most authors have described a series of papillæ, arranged in rows parallel to the axis of the auditory meatus, in the lower portion of the osseous meatus. The author demonstrates that the appearance of papillæ is simulated by transverse sections of ridges, which are arranged vertically to the axis of the auditory meatus, in other words, circular, parallel with the periphery of the tympanic membrane. This arrangement of ridges is found in embryos, in the new-born, in adults, and in animals. They are principally

found in close neighborhood of the membrane, and seldom extend around the entire circumference of the meatus, being principally observed in the floor of the canal. Only in exceptional cases are they observed continuing along the band of fibrous tissue, which passes from the upper wall of the meatus on to the membrane.

2. Both in human beings and animals, VOLTOLINI has comparatively seldom found the capillaries of the crista filled with blood corpuscles. The reviewer has frequently observed this injection in human beings. It can be demonstrated with nicety in specimens stained with picro-carmin and examined with a low power. The blood corpuscles stand out, stained a glistening bright yellow with sharp dark contours.

3. These investigations were conducted under Munk's directions. Similar to Gudden's experiments, they were made on young animals, the labyrinth being destroyed through mechanical means. After a period of seven to eight weeks the animals were killed, and the brain, medulla oblongata, and the petrous portion of the temporal bone were examined in series of microscopical sections. He advises the operation from the neck, penetrating near the articulation of the lower jaw into the depth, perforating the tymp. memb., and then trephining or boring into the labyrinth, as the simplest method. In his successful attempts the animals recovered without displaying any disturbances of co-ordinate muscular action. In two of those which showed disturbances of motion, serial microscopic sections were made; in one there was found marked degeneration of the cochlea and a beginning atrophy of the posterior acoustic and the facial roots, the vestibule (? Rev.) and anterior root of the acoustic remaining intact. In the other, the entire labyrinth and both roots of the acoustic were normal, while a state of complete atrophy, extending inwards to its nucleus, affected the facial nerve. There was also a co-existing degeneration of the pyramidal tract on the same side.

4. The investigations were made on human beings, both in adult and foetal states, and on cats. The results are as follows: (1) The posterior root of the acoustic nerve originates in the so-called nucleus acustici anterior. This is in connection (a) with the superior olivary body of the crossed side by means of a bundle of fibres called the "corpus trapezoides," (b) with the superior olivary body of the same side by a few fibres, (c) with the inner acoustic nucleus by a series of arch-shaped fibres which enclose the restiform body. Besides this, the author demonstrates con-

nections of the superior olivary body with the cerebellum and the nucleus of the abducens nerve. (2) The anterior root originates in the nucleus acustici internus. This is also in connection with the superior olivary body and the nucleus of the abducens through bundles of thin fibres. A third system of fibres, comprising part of the acoustic, is formed by a branch of the "direct sensory cerebellar tract." Under this nomenclature, Edinger describes a great portion of the tract called by Meynert and others "the inner division of the cerebellar peduncle." This bundle of fibres, enclosing the nucleus of Deiters, is in no relation with the acoustic nerve.

ANATOMY OF THE NASO-PHARYNX.

1. Dr. E. BAUMGARTEN, of Budapest. The causes of deflection of the nasal septum. *Deutsche med. Wochenschr.*, 1886, No. 22, p. 373.

2. Prof. E. ZUCKERKANDL, of Graz. Adenoid tissue in the nasal mucous membrane; 1 plate. *Wiener med. Jahrb.*, 1886, Heft 5, p. 219.

3. Dr. EM. KAUFMANN, of Prague. The function of the olfactory and epithelial cells in the olfactory region. (A communication from the laboratory of Prof. Schenk, in Vienna.) *Wiener med. Jahrb.*, 1886, p. 79.

4. CHIARI. Neoplastic growths of the nasal septum. *Rev. mens. de laryng., d'otologie, et de rhinol.*, 3, p. 121.

5. Prof. F. W. ZAHN, of Geneva. A contribution to the study of tumors. No. 5: Cysts containing ciliated epithelium in the naso-pharyngeal space. *Deutsche Zeitschr. f. Chir.*, Bd. xxii., p. 392.

6. W. WALDEYER. A contribution to the normal and comparative anatomy of the pharynx, with special attention to the deglutitory passage. A paper read before the Royal Prussian Academy of Sciences of Berlin, Feb. 25, 1886.

1. The author rejects the various theories regarding the origin of deflection of the nasal septum as unsatisfactory, and looks upon the pressure exerted by the swollen inferior and middle turbinated bones as the probable cause.

2. The author examined the nasal mucous membranes of human beings and various animals (dog, cat, sheep, hog, horse, deer, calf, hare) and found an almost identical condition in all. A sparse infiltration of lymphatic cells was found, as a rule. The presence of extensive adenoid tissue in the shape of diffuse infil-

trations or follicles was not general. The structures described as follicles also show a reticulum, which, besides the conglomeration of cells, constitutes the elements of a normal follicle. The adenoid tissue is principally found in the respiratory fissure, notably in the posterior segment. Here it frequently continues from the pharyngeal tonsil, extending on to the nasal septum. The irregular occurrence of follicles in the nasal mucous membrane may be regarded as normal, and is analogous to the conjunctival follicles.

3. The author attempts to decide the question, whether or not the epithelial cells and the olfactory cells of the olfactory region are identical or differ in morphological and physiological respects. He conducted his investigations on frogs, and concluded that the epithelial cells are the original and principal structural elements lining the olfactory portion of the mucous membrane, and that the olfactory cells develop from these.

5. The author describes three cases of cysts lined with ciliated epithelium, which were accidentally discovered in post-mortem examinations, and occupied the upper pharyngeal wall. External to the cyst walls was found a layer of adenoid tissue containing no glands; upon this was a layer of fibrillated connective tissue rich in glands but containing few cells. In the three cases a pit-like depression was noticeable on the anterior face of the basilar bone. The cysts were uni- and multi-locular, and in their position and construction corresponded to the pharyngeal bursa.

6. The author treats of the precautionary conditions existing in the larynx to prevent "false swallowing" in the act of deglutition.

PHYSIOLOGY OF THE EAR.

1. Dr. S. S. ISTAMANOFF. The relation existing between variations of temperature in the external auditory meatus and the cerebral circulation (from the physiol. laboratory of Prof. Tarchanoff, of St. Petersburg). *Arch. f. d. ges. Physiol.*, Bd. xxxviii., pag. 113.

2. Is. STEINER, of Heidelberg. The semicircular canals of the shark. Kgl. preuss. Acad. d. Wissensch. zu Berlin, 20 May., 1886. Reprint.

3. Dr. J. L. ECKERT, of Laufenburg. A contribution to the function of the semicircular canals. *Correspondenzbl. f. Schweizer Aerzte*, 1886, pag. 11.

4. Dr. W. KIESSELBACH, of Erlangen. Remarks on the above-mentioned article. *Ibid.*, pag. 259.

5. Dr. J. L. ECKERT, of Laufenburg. Counter-remarks on Kiesselbach's observations. *Ibid.*

6. VICTOR HENSEN, of Kiel. Investigation on the perception of noises (with reference to E. Brücke's review of a paper on this subject). *Arch. f. Ohrenheilk.*, Bd. xxiii., pag. 69.

1. In order to investigate the relation existing between the temperature of the external aural canal and the cerebral circulation, the author made a series of observations in a boy aged twelve, who suffered from a partial defect of the frontal bone, and who readily demonstrated any increase in the volume of the brain. He instituted a series of hot and cold hand-baths with simultaneous thermometric observations in the external meatus. He arrived at the conclusion that, in all cases without exception, immersions of the hands in cold water produced a reduction of the temperature in the extremities and also in the external meatus. Warm baths increased the temperature. The use of cold hand-baths called forth an increase in the volume of the brain with the simultaneous reduction of temperature in the auditory meatus. Warm baths were productive of an opposite state of affairs. These investigations are interesting in demonstrating also that cooling one portion of the body will produce a reduction of the entire body temperature, and that the blood, being forced out of the part exposed to the cold by the contraction of the blood-vessels, calls forth a secondary dilatation of the vessels in other portions of the organism, as demonstrated in the brain. Raising the temperature in a localized part has the opposite effect.

2. Compared with other animals the shark, due to its great power of resistance and especially to the comparative facility of carrying out the operations required, is very much adapted as a subject for physiological investigations on the semicircular canals. It will be futile to expect any disturbances of locomotion after destroying one or all three of the semicircular canals on one or both sides in the shark. This shows conclusively that the canals in the shark have no connection with the state of equilibrium. The author also discusses the question in relation to other animals, and dwells in detail upon the sources of error which led other investigators to opposite conclusions.

3, 4, 5. ECKERT, basing his conclusions more upon a résumé

of the literature of the subject than personal investigations, shares the view that the semicircular canals with their ampullæ are in connection with the organ of muscular co-ordination. He regards the pendulous motions following section of the canals the principal proof to substantiate his view. He considers the dichotomous division of the acoustic nerve another proof in favor. KIESSELBACH, sharing the opposite view, claims that the pendulous motion is absent in some cases after section of the canals, and that the entire question is by no means settled. In answering this, Eckert asserts that disturbances of co-ordination are the rule, and this in itself renders it highly probable that the apparatus of the semicircular canal is in relation with the sense of muscular co-ordination. The discussion contributes nothing new to our knowledge on this subject.

6. As it is difficult to understand this article, without dwelling in extenso upon the various publications to which it refers, and which, by the way, as yet have not been reviewed in this journal, reference to it will be reserved for the future.

PHYSIOLOGY OF THE NASO-PHARYNX.

1. EMIL FISCHER and FRANZ PENTZOLD, of Erlangen. The sensibility of the sense of smell. *Biolog. Centralbl.*, Bd. vi., 1886 (from a review in the *Deutsch. med. Zeitg.*, p. 429).

1. VALENTIN has demonstrated that a current of air, containing in 1 ccm $\frac{1}{30000}$ mgrm of bromine, or $\frac{1}{80000}$ mgrm of sulphuretted hydrogen, or $\frac{1}{200000}$ mgrm of oil of roses, will convey the characteristic odors of these agents. Taking into calculation the quantity of air requisite to produce an olfactory sensation, the strength of the volatile agents is as follows: $\frac{1}{800}$ mgrm of bromine, $\frac{1}{2000}$ mgrm of sulphuretted hydrogen, and $\frac{1}{20000}$ mgrm of oil of roses. The authors have discovered that the action of mercaptan and chlorphenol is by far more intense than the oil of roses. The odors of chlorphenol, in the proportion of $\frac{1}{230000000}$ mgrm in 1 ccm of air, and mercaptan, $\frac{1}{230000000}$ mgrm in 1 ccm of air, were still appreciable. According to Valentin's computation, the quantity of air considered, but $\frac{1}{400000}$ mgrm of chlorphenol and $\frac{1}{400000}$ mgrm of mercaptan are necessary to impart the characteristic odors. Accordingly, the sense of smell, in some cases, is a far finer test than the most delicate methods of investigation—for example, spectral analysis.

II.—PATHOLOGY AND THERAPEUTICS.

By A. HARTMANN, OF BERLIN, AND ED. SCHULTE, OF MILAN.

GENERAL LITERATURE.

1. Dr. KRETSCHMANN. Report of the Royal University Ear clinic at Halle for 1885. *Arch. f. Ohrenheilk.*, Bd. xxiii., p. 217.
2. Prof. DE ROSSI. Report of fourteenth year of aural instruction. Rome, 1886.
3. Dr. W. KIRCHNER. Report of the aural division of the University Policlinic of Würzburg for 1884 and 1885. *Münchener med. Wochenschr.*, No. 10, 1886.
4. SCHMIEGELOW, of Copenhagen. Report of the ear, nose, and throat cases treated in the General Hospital. *Hospitalstidende*, Bd. iii., No. 8.
5. MATHEWSON, PROUT, and RUSHMORE. Seventeenth yearly report of the Brooklyn Eye and Ear Hospital for 1885.
6. Dr. J. J. CHISOLM. Eighth annual report of the Presbyterian Eye, Ear, and Throat Hospital of Baltimore for 1885.
7. Dr. GHERARDO FERRERI. Surgical therapeutics of diseases of the ear. *Lo Sperimentale*, 1886, No. 3.
8. A. GRAHAM BELL. The possibility of educating the hearing of deaf-mutes. *Trans. Amer. Otol. Soc.*, 1885.
9. Dr. J. BARATOUX. Syphilis of the ear. Extract of the *Revue mensuelle*, etc., Paris, 1886. Delahaye and Lecrosnier.
10. Dr. B. ST. J. ROOSA. Presbykūsis. *Trans. Amer. Otol. Soc.*, 1885.
11. Dr. L. ROUGIER, of Lyon. Deux cas de lypémanie avec délire de persécution caractérisé par des hallucinations de l'odorat, du gout et de l'ouïe consécutives à des altérations de la muqueuse buccale, nasale et naso-pharyngienne et du squelette des fosses nasales. *Revue Mens. de Laryngol.*, etc., No. 5, 1886.
12. G. SETTERBLAD. A case of galvanic acoustic hyperæsthesia. *Hygiēa*, Bd. xlv., p. 164.
13. W. KIESSELBACH, of Erlangen. Study on tinnitus aurium. *Monatsschr. f. Ohrenheilk.*, 1886, No. 4.
14. LAURENCE TURNBULL. Some rare forms of tinnitus aurium, subjective and objective. *The Therapeutic Gazette*, March 16, 1886.

15. Dr. LONGHI. Bilateral dry middle-ear catarrh. Auditory scotoma on left side. *Bolletino delle malattie dell' orecchio*, etc., Anno iii., No. 6.

16. Dr. E. BAUMGARTEN. Propagation of hearing to the opposite side. *Arch. f. Ohrenheilk.*, Bd. xxiii., p. 122.

17. Prof. A. LUCÆ. Criticisms and new facts in tuning-fork tests. *Arch. f. Ohrenheilk.*, Bd. xxiii., p. 122.

18. H. KNAPP. On the desirability of adopting a uniform method of expressing the results of testing the acuteness of hearing. *Trans. Amer. Otol. Soc.*, 1885.

19. Dr. WEIL, of Stuttgart. Two minor modifications of Politzer's method of inflation. *Monatsschr. f. Ohrenheilk.*, 1886, No. 5.

20. Dr. MÉNIÈRE. Catheterization of the Eustachian tube. *Gaz. des Hôp.*, 1886, No. 34.

21. Dr. LANCEREAUX. Syphilitic papulo-pustular eruption following and due to catheterization of Eustachian tube. *Gaz. des Hôp.*, 1886, No. 25.

22. C. KELLER, of Cologne. Former and recent communications on peroxide of hydrogen (H_2O_2). *Monatsschr. f. Ohrenheilk.*, 1886, No. 6.

23. C. H. BURNETT. The local use of cocaine and brucine in diseases of the ear. *Trans. Amer. Otol. Soc.*, 1885.

24. S. S. BISHOP. Cocaine and other analgesic means in otology. *Four. Amer. Med. Assoc.*, Feb. 20, 1886.

25. E. E. HOLT. Does cocaine increase the congestion, while diminishing the pain, in acute inflammation of the middle ear? *Trans. Amer. Otol. Soc.*, 1885.

1. KRETSCHMANN'S report of the ear clinic at Halle for 1885 treats of 1039 patients presenting 1159 cases. The operative cases are of greatest interest, principally those affecting the mastoid process. Of these 32 were operated, including 16 acute cases, all but two terminating in recovery, and 16 chronic cases, of which six were healed, eight improved, and two ended fatally. The fatal termination in one of the acute cases was caused by septic meningitis, set up by the entrance of purulent masses through a fissure in the thin shell of a rachitic bone caused during stripping off the periosteum. Death in the second acute case was due to pneumonia, the operation and healing of the wound having progressed favorably

for three weeks. The fatal termination in both chronic cases was due to pyæmia ; in one case setting in nine days after the operation, in the other already on the same day. The author, based upon Schwartz's experience, claims that the operation in the last case was justifiable, if not necessary, and refers to an instance within his own experience in which an operation at this stage of the disease saved the patient. Among the detailed clinical histories of the individual cases is one of chiselling of the antrum, in which a communication with the external auditory canal was established only twenty-five days after the operation.

The author describes in full two cases of exfoliation of the necrosed cochlea, one of which was considered a case of primary necrosis of the labyrinth ; two cases of facial paralysis due to cauterizations of the wound canal in mastoid operations, a case of primary periostitis of the mastoid process probably produced by the irritation of aspergillus growths in the external meatus ; also three cases of removal of the hammer. He furthermore describes a case of labyrinthian disease following diphtheria, which was greatly benefited, almost cured, by the use of pilocarpin, and another case of reflex epilepsy called forth by disease of the ear. Three cases of aural affections due to syphilis, ulcers in one being situated on the posterior pharyngeal wall, in the other on the soft palate, and in the third on the tonsils, all being treated locally, in connection with antisyphilitic constitutional treatment, with the galvano-cautery, induce the author to lay special stress on the topical treatment. The reviewer has seen the same favorable result in a number of cases treated similarly, but at the same time has observed equally as good and rapid results in other cases treated exclusively with antisyphilitic agents, no local medication being adopted. The galvano-cautery accordingly is not an absolute necessity in converting syphilitic into benign ulcers. Solutions of sublimate have been introduced in Schwartz's clinic as an antiseptic during the last year. In cleansing the ear in chronic otorrhœa the strength of the solution has been 1:5,000, in operations on the mastoid process 1:1,000, and during the period of after-treatment from 1:3,000 to 5,000. The use of lactic acid in caries of the middle ear has also been tested. The use of a 15 to 20 % solution produced such pain, however, that this mode of treatment had to be abandoned. The use of iodine preparations, iodol, as recommended by Mazzoni of Rome, was followed by more favorable results. A solution of 2.0 to 16.0 of alcohol and

34.0 of glycerine was applied in those cases of caries in which the bones were necrotic. Immediately after the first application, the amount of secretion diminished and the fetor disappeared. S.

2. During the winter of 1884-85, 583 ear patients were treated in the ear clinic of Prof. Rossi, of Rome, this being the only institution of its kind in Italy. Of 25 cases of acute hyperæmia of the middle ear, observed principally from February to the end of April, all, with the exception of five cases which passed from observation, were entirely cured. The author, who formerly made paracentesis in all these cases, now restricts himself to those in which there is great pain; his results are just as good. Rossi, in dwelling upon the diagnosis of acute purulent middle-ear inflammation, disagrees with those authors who claim that the membrane is more or less convex in shape in cases of serous or purulent exudation in the tympanic cavity. Due to the usually co-existing swollen condition of the Eustachian mucous membrane and the consequent lack of ventilation of the middle ear, the membrane is generally more concave than normally. The resistance of the fibrous layer of the membrane is much too great to be overcome by the pressure of an accumulation within the tympanic cavity. Also, in these cases, the author made paracentesis only in those in which great pain existed. After making a long incision the ear was treated with insufflations of boracic acid. In small perforations this mode of treatment was not considered practical; either the opening was enlarged to obviate the plugging up of the perforation by the powder, or the powder was applied dissolved in glycerine. It is worthy of mention, that Rossi thus prevented these cases from becoming chronic. Calomel acted efficiently in cases of mucous secretion and hyperæmia of the aural meatus occurring in children, while the use of caustic solutions of nitrate of silver was followed by excellent results in cases of great hyperæmia of the tympanic cavity with interstitial or free exudation. Next in efficiency, the author praises resorcin in alcoholic solution and iodoform in cases of granulations. Rossi advocates the use of absolute alcohol to diminish profuse secretion, but expresses his doubts whether it has a determined action on granulations; in these cases he prefers the use of the solid nitrate of silver. The author classifies all conditions following hyperplastic middle-ear catarrh, chronic suppurations, and all trophic disturbances demonstrating any atrophic changes, under the heading, results of chronic inflammation of the middle ear.

Fifty-five of these cases are recorded, only eleven of which were improved.

Twelve cases of disease of the temporal bone following supuration of the middle ear, eleven in children and one in an adult, are recorded. The treatment consisted in removal of the diseased portions of bone with the chisel or sharp curette, and after-treatment with iodoform. Of these, four were cured, two improved, three not benefited, and four passed from observation.

Rossi, in speaking of the twenty-six cases of disease of the acoustic nerve, dwells upon the insufficiency of our present methods of examination. He places great diagnostic value upon the experiment published by Gruber in the *Monatsschr. f. Ohrenheilk.*, Bd. xix., No. 2, in cases of marked diminution of hearing power.

The following cases are described in detail in a supplement. Two cases of ankylosis of the hammer and anvil resulting from chronic middle-ear suppuration, in which disarticulation of the stapes from the anvil was followed by brilliant results. Several cases of caries of the petrous portion of the temporal bone caused by evacuation of the mastoid antrum, and the details of a case of caries complicated with an abscess at the angle of the jaw and other grave symptoms. In the last case recovery set in two and a half months after opening the mastoid process. The author further describes favorable results attending the use of jequirity in chronic suppurative inflammations of the middle ear, and adds a report of an autopsy upon a case of abscess of the peduncle of the cerebellum resulting from suppuration of the middle ear. S.

3. Eight hundred and twenty-five cases were treated during a period of two years in the aural clinic of the University of Würzburg. Furuncles of the external meatus were treated with warm compresses moistened with a two-per-cent. solution of acetate of alum. The author obtained good results in treating cases of acute catarrh of the middle ear, characterized by very viscid, stringy secretion, with diluted solutions of liq. natr. caustici (0.01-0.03 : 100 water). These were used two to three times daily in the form of instillations, syringing, and injections per tubam. The author recommends the use of bandage-cords of sublimate-gauze, already described on a former occasion, in cases of profuse otorrhœa. The description of a case of fracture of the handle of the hammer and rupture of the membrane is given in detail. A case of long-standing suppuration of the middle ear, which had been treated

by repeated curetting of the mastoid process, was cured by the expulsion in syringing of a large portion of the cochlea. Complete deafness existed. H.

4. June, 1883, an ambulatorium was opened in the general hospital of Copenhagen for the treatment of ear, nose, and throat diseases. The report covers the period up to the beginning of 1885. In all 406 patients, presenting 473 cases, were treated. One hundred and ninety-five were cases of ear disease, otitis media occurring often (69). There were 111 pharynx diseases, cases of adenoid vegetation being quite frequent (41). Diseases of the nose were represented by 82 cases. The laryngeal cases numbered 56. There were 5 cases of œsophageal disease, including 1 of simple stricture. Nineteen cases are not included in the above-mentioned classification. V. BREMER.

5. The total number of ear patients was 1,671. The number of operations was 59, among them being 15 Wilde's incision; 134 polypi removed; 2 sequestra from meatus.

SWAN M. BURNETT.

6. The total number of ear cases was 1,315. Among the operations were 6 polypi, 3 openings of the mastoid, and 2 tumors of the auricle.

SWAN M. BURNETT.

7. FERRERI, an assistant of the University Ear clinic of Rome, describes the methods of treatment practised there. As antisepsis should be the basis of every surgical procedure, he properly lays stress upon its adoption in the treatment of ear diseases, notably so in diseases of the tympanic cavity. He also draws attention to the necessity of a thorough disinfection of all instruments used in examination and operation, so as to prevent any possible infection, as still occurs. In general, the mode of treatment adopted does not differ from that in use in Germany. The author is an advocate of warm irrigations in chronic eczema of the auricle (in these cases it is mixed with a solution of sublimate and continued for two hours), in painful furuncles, in profuse dermatitis of the external meatus, and in myringitis.

The author employs iodoform in an etheric solution in chronic inflammation of the middle ear accompanied with purulent secretion, and to reduce granulations in the tympanic cavity of scrofulous children. When the secretion is more mucous in consistency, resorcin is used.

The first stage of sclerosis, called by the author, after Rossi, otitis media hyperplastica (proliferous infl.—Roosa), is treated with

solutions of caustic soda or iodide of potash injected per tubam into the middle ear. Adhesions or cicatricial membranes are treated with free incisions of the membrane, first of all, as a means to assist in a precise diagnosis, and secondly, as a preliminary step in the local treatment. The treatment with inflations of gaseous substances, as recommended by other observers, in these conditions has been discarded as useless. Injections of caustic remedies proving of no benefit in the more advanced stages, instillations of jequirity are used with the purpose of creating great congestion of the mucous membrane of the middle ear and favoring rapid absorption of the lymphoid exudation. The author has used the rarefactor of Delstanche with marked benefit in cases of pronounced retraction of the membrane accompanied with distressing tinnitus. He also advocates its use in cases of suppuration of Shrapnell's membrane, to remove through the usually small perforations, by suction, the accumulated secretion, which it would be difficult to remove by the air-douche.

8. Prof. BELL set forth the necessity and showed the possibility of deaf-mutes being taught to speak ; also, the importance of correcting our statistics in regard to the cause of deaf-mutism, alluding to the possibility of propagating deaf-mutism by the inter-marriage of congenital deaf-mutes. SWAN M. BURNETT.

9. The treatise of BARATOUX, comprising 132 pages, has been published in separate parts at various times in the *Revue mens. de Laryngol.*, etc. The author has conscientiously and critically collected the entire literature, both modern and old, on syphilis of the ear. The treatise also contains a number of personal observations. H.

10. ROOSA suggested that the term presbykosis be applied to the diminution of hearing due to the changes accompanying old age and which may be considered as physiological. These are manifested by a diminished bone-conduction and a confusion of hearing in noises. SWAN M. BURNETT.

11. ROUGIER describes two cases of necrosis accompanied by purulent secretion from the nose, the one due to syphilis, the other the result of a trauma. The symptoms, as given in the title and described in detail in the paper, were immediately relieved by the expulsion of the sequestrum in the one case, and complete recovery followed healing in the other. The author attributes the psychical disturbances to the irritation of the sensory nerves. H.

12. SETTERBLAD describes a case of rheumatic facial-paralysis, impaired hearing and great tinnitus, and lays special stress upon the galvanic hyperæsthesia of the acoustic nerve, so frequently a concomitant. He praises the action of the constant current in these cases. V. BREMER.

13. KIESSELBACH'S studies on the origin of tinnitus aurium and the portions of the ear giving rise to it, lead to the following conclusions:

(1) Tinnitus is produced by a hyperæsthesia of the sound perceiving apparatus. In some, this condition is a constant feature, in others but transitory, the result of a sudden change in the intralabyrinthian pressure.

(2) The hyperæsthesia itself cannot produce any sound impression, but gives rise to the possibility of hearing the blood noise constantly present (principally due to the increased resonance sound of the cavities of the middle ear) in an exaggerated degree. In normal conditions, this blood noise or resonance sound is not perceived as a result of irritation.

(3) It is possible, that an increase of the blood noise or a heightened irritability of the terminal acoustic filaments, in itself may suffice to render the tinnitus perceptible. In the majority of cases, both factors, however, come into play. In speaking of the treatment, Kiesselbach considers the protection of the patient from the cause of the hyperæsthesia, such as noises and music, of primary importance. Spontaneous tinnitus, the result of tubal catarrh, is treated with bougies, and faradization of the tubal muscles. Those cases of tinnitus directly due to the prolonged action of noises or mechanical insults are best treated with injections of pilocarpin, and abstracting blood from the vicinity of the ear. Lucaë's treatment with tones is indicated only in older cases, the author not favoring its use in recent cases. S.

14. TURNBULL describes the clinical features of five cases of tinnitus aurium. One case of objective tinnitus is of special interest, as being due to spastic contractions of the muscles of the Eustachian tube. A simultaneous contraction of the velum palati was noticeable with the aural tinnitus. The application of the constant current produced a recovery. H.

15. LONGHI observed, on examining a woman who was suffering from a chronic, dry, middle-ear catarrh on both sides, that the tuning-fork was heard distinctly at a distance of 25 to 15 cm, but was not perceived at 10 to 15 cm. At a distance of 10 cm it was

again plainly heard, and so close up to the ear. The author compares this condition with that defect occurring in vision, and calls it *scotoma auditivum*. He does not treat of it in the sense of a special disease, but regards it a result either of an unequal tension of various portions of the tympanic membrane, or this combined with some disturbances of auditory accommodation. S.

16. BAUMGARTEN noticed that the transfer of sound in the experiment of Rinne with the tuning-fork, from the ear tested to the other ear, in the great majority of cases occurs only when the tuning-fork is placed vertical on the mastoid process, and, as a rule, only in those tuning-forks that produce a large number of vibrations. Experiments have shown that that portion of the mastoid usually selected in opening the antrum is the best point to apply the tuning-fork. The author confirms the experiment that the sound of a tuning-fork placed vertical upon the mastoid process of a person with normal hearing power will be transferred to the opposite ear, the latter having been plugged with cotton. On closing the opposite ear firmly with the finger the sound will be heard still more distinctly, even if the ear corresponding to the point of application of the tuning-fork has been plugged with cotton. As soon, however, as this ear is also closed with the finger the sound transference ceases. On plugging the ear with cotton only, the transfer of sound is best studied on changing the parallel position of the tuning-fork to a vertical one in applying it. The ear being closed with the finger the oblique position of the applied tuning-fork will already produce a sound transference. Upon the presence of an impediment to sound conduction in one meatus, the tuning-fork applied to the vertex of the skull will be heard best on the same side; this, however, cannot exclude with any certainty a co-existing middle-ear affection. If, in such a case, the tuning-fork, placed on the mastoid of the sound side, is perceived on the affected side, but again transferred to the other side upon plugging the corresponding sound ear with the finger, the possibility of any co-existing middle-ear affection can be excluded with certainty. If, on the contrary, the sound is not perceived in the ear, the seat of the sound-conducting impediment, any middle-ear complication can be excluded *a priori*, as the tuning-fork applied to the vertex will not be heard better in either ear, thereby indicating the limited effect of the impediment. In disease of the middle ear, the sound of the tuning-fork placed on the mastoid of the opposite side, may be transferred or not. In case

the sound was perceived on the affected side, and then was transferred to the sound side upon plugging the ear of this side with the finger, the author considers the prognosis of the disease favorable. If, under these circumstances, the sound is still transferred to the affected side, notwithstanding the plugging of the sound ear, prognosis is unfavorable. Even if improvement take place, return to the normal condition is out of question. The degree of the prognosis of each individual case is also dependent upon the time, expressed in number of seconds, in which the tuning-fork, placed vertical upon the mastoid process of the sound ear, is still heard in the affected ear after it is no longer perceived on this side through air-conduction. If, in case of bilateral ear affection, the sound of the tuning-fork is not transferred to either side, it is probable that the disease is in the same stage in both ears.

In treating of the diagnosis of labyrinthine disease, the author always found that in case the tuning-fork applied to the vertex is heard on the affected ear, and in Rinne's test, the fork placed on the mastoid process of the affected side, is perceived in the other ear, disease of the labyrinth was developing. However, if the tuning-fork placed upon the skull is perceived in the better ear, and in Rinne's test is also transferred to this side, the diagnosis of labyrinthine disease can be established with more certainty. S.

17. The publication of LUCÆ's has been thoroughly reviewed by TRUCKENBROD in the report of the otological section of the fifty-eighth Naturforscher Versammlung at Strasburg (*vide* ZEITSCH. F. OPR., vol. xv., p. 193).

18. KNAPP thinks that no one test of hearing is sufficient, and criticises Bezold for using whispered speech alone in his examinations. He thinks that the perception of noises is often impaired at the beginning of deafness, when speech is well heard. He would have the watch, whispered voice, and conversational voice all used, and the hearing faculty expressed in a uniform, systematic method, and suggests the following: All defects in hearing the watch or speech to be expressed in fractions of the normal hearing distance. For watches, this must be determined experimentally for each one. The normal hearing distance for his whispered speech he takes to be about 20'; for his ordinary speech, 60'; and offers the following symbols for recording the degrees of hearing power:

$h = \frac{2}{4}$ = normal audition for (his) watch.

$v = \frac{2}{8}$ = n. a. for whisper.

$v = \frac{0}{0}$ = n. a. for speech.

$v = \frac{2}{\infty}$ } whisper or speech heard, but not understood—quantita-
 $v = \frac{6}{\infty}$ } tive perception of sound.

$v\ 60' = 0$ = voice not heard at all.

H or AUD. = 0 = complete deafness for all sounds.

$h = \frac{c}{24''}$ = watch of 24 inches normal hearing distance on contact with the ear.

$h = \frac{pr}{24''}$ = watch when pressed on the ear.

$h = \frac{m}{24''}$ = watch heard when applied to mastoid.

$h = \frac{t}{24''}$ = watch heard on temple.

$h = \frac{d}{24''}$ = watch on teeth.

$h = \frac{gl}{24''}$ = watch on forehead.

$h = \frac{v}{24''}$ = watch on vertex.

$h = \frac{ub}{24''}$ = watch heard everywhere.

When used to denote absence of hearing, these symbols are used as follows :

$h\ \frac{c}{24''} = 0$ means that the watch is not heard on contact.

$h\ \frac{ub}{24''} = 0$ means that it is heard nowhere.

A committee, consisting of Drs. Knapp, Roosa, and Prout, was appointed to report on a uniform measure of hearing at the next meeting.

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19. In inflating according to Politzer, WEIL, imitating Loewenberg, suggests that the neck of the patient be observed and the air-bag be compressed at the moment the larynx is raised. In order to produce a modified air-pressure he does not compress both nostrils, but leaves one open.

S.

20. Induced by the publication of Lancereaux on infection of syphilis by means of a catheter, in the *Gaz. des Hôpitaux*, Feb. 23d, MÉNIÈRE describes his method of disinfecting catheters. He solely uses silver catheters, which are kept in a vessel filled with alcohol. Before using a catheter he exposes it for some moments to the heat of an alcohol flame. The alcohol within the catheter is thus set on fire, and the instrument radically cleaned ; it is then dipped in cold water. The catheter is then thoroughly cleaned with copper wire. Using this method, it is impossible (?) to produce any syphilitic infection, even using the catheters employed in the treatment of syphilitics. The author soaks the rubber bougies used in dilating the tube in alcohol, and keeps them in a bottle containing tincture of iodine. Every patient, suspected to be syphilitic, is treated with his own bougie.

S.

21. In January of this year LANCEREAUX discovered in a patient unmistakable symptoms of secondary syphilis. In seeking for the source of infection, the only point elicited was that a profuse epistaxis followed the introduction of a Eustachian catheter. Upon this the author based his conclusion that the catheter was the medium of infection. According to data, the first catheterization, the infectious one, took place in the middle of September. As the epistaxis followed a repetition thereof in November, indications would point to a pre-existing chancre in the interior of the nose. In December, three months after incubation, at the time of observation, the patient presented an exanthema. Although it is very doubtful whether the disease can be attributed to the source ascribed by the author, the importance of thoroughly disinfecting all catheters after use cannot be overestimated. S.

22. KELLER gives a full history of the therapeutic experiments and use of the peroxide of hydrogen. He used this agent in a sixteen-per-cent. solution in several cases of chronic middle-ear suppuration, but found it possessed no advantages over the ordinary methods of cleansing the ear. He found its use advantageous in cases of pus accumulations, which are difficult to get at and remove by syringing, as the H_2O_2 coming in contact with the pus not only rendered it fluid, but the ozone, generated by the catalysis, disinfects parts not reached by the fluid itself.

S.

23. The author has not found the sulphate of cocaine of any value in relieving the pain of otitis media or externa. The hydrochlorate has been somewhat efficacious, but only in superficial congestion of the tissues. He has used brucine in several cases, however, with decided relief to the pain, and particularly in otitis externa, it apparently anæsthetizing the skin more promptly than the mucous membrane. He used it in five-per-cent solutions.

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24. The author reports that he has been able to subdue the pain of acute otitis media, when the *Mt* was intact, by instilling a four-per-cent. solution of cocaine into the meatus, and allowing it to remain in contact with the membrane for five minutes. The pain, he says, seldom returns after the first application.

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25. The writer, as the result of his experience, answers the question in the affirmative, and the point seemed to be sustained in the discussion of the paper.

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INSTRUMENTS AND APPARATUS.

26. K. BEERWALD. Ueber einen neuen Hörmesser. (On a new acoumeter.) *Arch. f. Ohrenheilk.*, Bd. xxiii., p. 141.

27. Dr. L. SUNE MOLIST. Nuovo apparecchio per l'insufflazione nelle trombe e nelle casse del timpano, mosso per mezzo di pedale. (A new apparatus, moved by a pedal, to inflate the E. tube and the drum cavity.) *Bolletino delle malattie dell' orecchio*, etc., 1886, No. 2.

28. Dr. P. RADZIG, of Moscow, Russia. Ein einfaches Mittel die Brauchbarkeit der Fischbein-Bougies (für die Tuba) zu erhöhen. (How to render whalebone bougies pliable.) *Monatsschr. f. Ohrenheilk.*, 1886, No. 2.

29. M. J. MOLONY. The aural reservoir. *The Lancet*, 1886.

30. Dr. MOURE. Canule nasale et auriculaire. *Gaz. des Hôpit.*, 1886, No. 50.

31. Dr. ZIEM. Notiz über Conservirung der Rachen-und Kehlkopfspiegel. (How to prevent the tarnishing of laryngeal mirrors.) *Monatsschr. f. Ohrenh.*, 1886, No. 5.

32. Dr. L. KATZ, in Berlin. Ein Instrument zur Untersuchung der Nasenhöhle. (A nasal speculum.) *Berliner klin. Wochenschr.*, 1886, No. 9.

33. Dr. ANTONIO RANIERI. Di un nuovo rhinobyon. (A pneumatic nasal plug.) *Bolletino delle malattie dell' orecchio*, etc., 1886, No. 3.

26. The acoumeter described by BEERWALD consists of a series of bells from C to C⁴, and a movable hammer to strike them with. The foot of the apparatus can be drawn out like that of a music stand, and the height of the bells thereby adjusted to the level of the ear under examination. The hammer, like the bells, is made of steel, but has one side covered with cork. It is made movable in a slot and therefore can be brought opposite any bell of the series. It can also be made to revolve around its axis, so as to strike either with its bare face or with that lined with cork. A quadrant arranged at its side enables the operator to graduate the momentum of its fall. The bells are made so as to produce sounds of single tones only, without any overtones.

27. MOLIST publishes a description of a stationary apparatus constructed by Salelles, his assistant, for the purpose of inflating the Eustachian tubes. The apparatus being worked by the foot,

one hand of the operator is left free, while the other is engaged in holding the catheter in place. S.

28. On account of their stiffness, whalebone bougies are apt to cause laceration of the mucous membrane of the Eustachian tubes. In order to render them soft and pliable, RADZIG recommends that they be immersed in a dilute solution of carbolic acid for two or three days before being used. S.

31. ZIEM suggests that laryngeal mirrors should be warmed again after having been cleansed, in order to remove by evaporation any water which may have penetrated between the glass and the setting. This precaution will prevent tarnishing of the mirrors. S.

32. KATZ has constructed an apparatus by the aid of which the tip of the nose can be kept raised so as to allow a more unobstructed view of the interior of the nose when examined by the aid of a speculum. Such an apparatus will appear superfluous to all those who use the Hartmann-Böcker nasal speculum. S.

33. RANIERI has constructed his rhinobyon for the purpose of plugging the nostril, and at the same time allowing the patient to breathe through it. It consists of a rubber tube of medium hardness and of the size and shape of a Bellocq's canula, and which is surrounded in its entire length by a rubber bag. This bag can be inflated by a second tube, which is of smaller calibre and considerably shorter than the main tube, and runs parallel with its anterior extremity. A valve provided at the posterior end of the small tube prevents the air inflated into the bag from escaping. The apparatus acts as a pneumatic tampon.

EXTERNAL EAR.

34. E. R. CORSON. A case of bilateral rudimentary pinna and absence of external auditory meatus. *N. Y. Med. Times*, May, 1886.

35. E. DYER. Fistula auris. *Trans. Am. Otol. Soc.*, 1885.

36. Dr. HESSLER. Cyste in der Ohrmuschel nach traumatischem Hämatom. *Arch. f. Ohrenheilk.*, Bd. xxiii., p. 143.

37. Dr. SANGER BROWN. Hæmatoma auris. Three cases treated by the conjoined use of massage, galvanism, and leeching. *Med. Record*, June 10, 1886.

38. Dr. McKEOWN, in Belfast. Keeping perforations of the membrana tympani open. *The Lancet*, 1886, p. 691.

39. Dr. UCKERMANN. Stappelse, Udridning af Trommehinder. *Norsk Magazin f. Laegevid.*, Bd. xvi., p. 133.

40. Sir W. B. DALBY. The functions of the membrana tympani illustrated by disease. *Amer. Jour. Med. Sci.*, July, 1886.

41. Dr. C. MIOT. Tumeur du manche du marteau. (Tumor of the handle of the hammer.) *Revue mens.*, 1886, No. 3.

34. In a colored infant, three days old when seen, both pinnae were rudimentary. There was a small skin flap recognizable as the lobule, a mere wrinkling of the skin representing the auricle. A dimple in the skin marked the ordinary position of the meatus.

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35. The observation was made on a girl of fourteen years, affected since birth with an offensive discharge from the fistula. A probe could be passed 1 cm. The fistula was destroyed by the galvano-cautery.

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36. HESSLER had occasion to operate on a cyst of the right auricle which had been preceded by a suppurating traumatic hæmatoma. In consequence of an injury received in 1880, a "cystoid" swelling, the size of a hazel-nut, had formed in the hollow of the auricle, which, on being incised, discharged some thin, pale yellow pus. After this a new cyst formed, which, in the course of time, became painful. In 1882 an incision, 2 cm long, was made under chloroform which liberated a brownish, watery liquid free from fibrinous shreds. The cartilage was laid bare to the extent of one square cm, where it was yellowish white and showed an irregular rent. This portion was removed by means of scissors. The wound was plugged with tampons. Perfect healing.

In connection with this case Hessler discusses the origin of cysts of the auricle in general, and repeatedly attacks the theory of the reviewer, who maintains that cysts may form spontaneously and independently of any hæmatoma. (See Germ. Edit., vol. xv., p. 133.) He considers the formation of a cyst to be invariably the result of some traumatism which causes slight hemorrhage between the cartilage and the perichondrium, and an inflammatory state of the latter, with the production of subperichondrial bloody serum. This view is doubtlessly correct as far as Hessler's own case is concerned, which ought rather to be regarded as one of abscess, but it does not apply at all to the idiopathic formation of cysts without traumatism and without inflammatory symptoms, as described by the reviewer. Not having any original observa-

tions of his own to offer, Hessler distorts the observations of others in order to make them serve his purpose. He maintains, for instance, that in the second case of Blake, which he has not even read in the original, there must have been an injury followed by hemorrhage. Now Blake made an incision into the swelling on the very day it had first made its appearance, and the liquid evacuated was transparent serum. There was no history of violence, and the case was evidently one of idiopathic cyst.¹

37. Two of the cases were puerperal mania, and the other acute mania. Galvanism was used twice a day and massage four to six times daily.

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38. McKEOWN describes a new method for establishing permanent artificial perforations of the membrana tympani, similar to one that has been proposed by Von Troeltsch. He forms a triangular flap with the base downwards. The free apex of such a flap will fall downwards and become agglutinated to the lower portion of the drum membrane by means of extravasated blood, etc. Such an opening will remain patent for weeks or even months. The author has carried out this method in order to verify his diagnosis in cases of affection of the middle ear, but mostly for the purpose of dealing directly with hypertrophic changes of the lining membrane of the tympanum. The majority of the cases so treated showed more or less improvement, a few remained stationary, and none became worse. S.

39. UCKERMANN reports three cases of relaxation of the drum membrane in consequence of misuse of Politzer's method. They were treated by galvano-caustic puncture. The patients were children of from five to ten years and suffered also from adenoid vegetations of the naso-pharyngeal space.

V. BREMER.

40. From clinical observations which have been carried out with considerable care the author concludes: (1) That structural changes, particularly calcareous deposits, in the tympanic membrane of a very extensive nature may exist without impaired hearing. (2) Loss of continuity in the tympanic membrane does not necessarily interfere with its function, provided that the ligamentous support which it affords to the chain of ossicles is not impaired.

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¹ Hessler as well as Blau (see *Arch. f. Ohrenh.*, Bd. xxiii., p. 185) regrets that I omitted to mention a case that had been reported by the latter author. I regard this case to have been one of perichondritis, perhaps also of hæmatoma, but by no means one of idiopathic cyst with absence of inflammatory symptoms, and for this reason I did not include it in my list.

HARTMANN.

41. MIOT found a tumor consisting of three lobes firmly attached to the upper part of the manubrium mallei in a female patient who had become hard of hearing in consequence of purulent otitis media. It felt hard when touched with a probe, and was tender. Other methods failing to relieve the impairment of hearing, the tumor was removed by a knife curved on the flat, the operation being followed by considerable improvement in the power of hearing. Baratoux, who made a microscopical examination of the growth, found the cortical portion to consist of concentric layers of connective tissue and containing cells, while the central portion was composed of embryonic cells provided with large nuclei, which were disposed in very loose connective tissue.

THE MIDDLE EAR.

42. C. N. DIXON JONES. Acute suppurative inflammation of the middle ear; septic meningitis; pyæmia; marked pyrexia; death in eight days. *N. Y. Med. Record*, June 12, 1886.

43. G. BACON. A case of acute otitis media suppurativa, followed by mastoid disease and pyæmia; mastoid operation; recovery. *Trans. Amer. Otol. Soc.*, 1885.

44. H. CHATELLIER. Otite moyenne suppurée droite. Polype du conduit. Carie du rocher. Éruption d'herpes dans le conduit et sur le pavillon. (Herpes of the external ear occurring during the course of suppuration of the middle ear, etc.) *Annales des maladies de l'oreille*, etc., 1886, No. 6.

45. Dr. DUJARDIN, in Havre. Note sur le traitement de la suppuration de la caisse par des instillations de sublimé (four observations). (Sublimate in otorrhœa.) *Revue mens.*, 1886, No. 6.

46. Dr. A. EITELBERG, of Vienna. Die Ohrpolypen und ihre Behandlung. (On aural polypi and their treatment.) *Centralbl. f. d. gesammte Therapie*, 1886.

47. Dr. HESSLER. Casuistische Beiträge zur operativen Behandlung der Eiterungen im Warzenfortsatze. (The operative treatment of suppuration of the mastoid.) *Arch. f. Ohrenheilk.*, Bd. xxiii., p. 90.

48. A. CECCHERELLI, in Parma. Trepanazione della mastoide. (Trepining of the mastoid bone.) *La Riforma medica* (Naples), 1886, No. 4.

49. SIMEON SNELL. On the implication of the mastoid bone in ear disease. *The Lancet*, 1886, vol. i., No. 4.

50. Dr. VICTOR HORSLEY. Suppuration in mastoid cells, with thrombosis of lateral sinus and septic embolism. *The Lancet*, 1886, p. 1068.

51. E. M. STEPANOW. Zur Frage über die Function der Cochlea. (On the function of the cochlea.) *Monatsschr. f. Ohrenh.*, 1886, No. 4.

52. O. D. POMEROY. A fatal case of suppurative otitis media, with abscess of the cerebellum, necrosis and caries of the petrous portion, and hyperostosis of the roof of the tympanum. *Trans. Amer. Otol. Soc.*, 1885.

53. C. J. KIPP. A case of fatal ear disease beginning as a circumscribed inflammation in the outer half of the external auditory canal. *Trans. Amer. Otol. Soc.*, 1885.

54. A. MATHEWSON. Diseases of the brain resulting from affections of the ear and the temporal bone. *N. Y. Med. Jour.*, June 12, 1886.

55. S. SEXTON. Two cases of neglected ear disease in infants resulting in death. *Trans. Amer. Otol. Soc.*, 1885.

56. S. SEXTON. Inflammation of the attic of the tympanum. *Trans. Amer. Otol. Soc.*, 1885.

57. Dr. STANISLAUS VON STEIN, of Moscow. Über die Massage der Gehörknöchelchen und die Stimmgabelcur der Gehörsempfindungen. (On massage of the ossicles of hearing and the tuning-fork treatment of tinnitus.) *Deutsche med. Wochenschr.*, 1886, No. 7.

58. Dr. P. MCBRIDE. The prognosis of chronic non-suppurative middle-ear affections. *Edinb. Med. Jour.*, May, 1886, p. 1006.

59. C. H. BURNETT. The relation between chronic otitis media catarrhalis and chronic rhinitis. *Trans. Amer. Otol. Soc.*, 1885.

42. The patient was a woman, thirty-three years of age, affected with furuncles over her body. She had been nursing a woman who died of septicæmia. SWAN M. BURNETT.

43. The patient was a man, twenty-three years of age, and the clinical history, which is given in full detail, is typical of such cases. The opening in the mastoid was made by a drill, and the cavity contained 3 ii of pus. SWAN M. BURNETT.

44. CHATELLIER, in a case of chronic otitis media with polypi, twice saw herpes of the external auditory canal and the auricle,

caused by the employment of an alcoholic solution of boric acid. Under the persistent use of this solution and the additional employment of lunar caustic, the herpetic blebs became confluent and transformed into ulcers, which healed under mercurial ointment. H.

45. DUJARDIN recommends a solution of corrosive sublimate, of the strength of 1 to 500, to be injected through a tympanal tube, introduced by means of a Eustachian catheter, for the treatment of suppuration of the middle ear. Out of four cases reported he cured two, and in the other two he succeeded in considerably diminishing the amount of secretion. H.

46. There are no novel features in EITELBERG's paper on aural polypi and their treatment, but we commend it, nevertheless, as an exhaustive and meritorious essay, showing considerable research, and well illustrated by cases of the author's own practice. The histology of aural polypi, their etiology, location, diagnosis, history, differential diagnosis, prognosis, and treatment are discussed in separate chapters. H.

47. HESSLER continues his report of mastoid operations, which he began in vol. xxi. of the *Arch. f. Ohrenh.* There are several interesting details both as regards the histories of cases as well as the method of operating. S.

48. In a patient who had been afflicted with purulent inflammation of the middle ear for a long time, and had suffered from violent pain on that side for two months, CECCHERELLI opened the antrum by means of a chisel. Only a few drops of pus were found, but the pain ceased immediately, and the hearing power, which had declined considerably before the operation, was restored to the degree previously enjoyed by the patient. S.

49. SNELL refers to the fact that cases of mastoid disease have been observed without preceding or concomitant disease of the middle ear, but thinks that this will always remain exceptional. Out of seven cases, from his own practice, of mastoid disease in consequence of middle-ear trouble, four recovered after free drainage of the tympanum had been re-established by the removal of polypi from the auditory canal and the tympanic cavity. The remaining three cases recovered after Wilde's incision. In case he should have to open the mastoid by an operation, Snell proposes to use Dalby's drill with stop arrangement. Taking into consideration the variable situation of the antrum mastoideum, we cannot consider the stop arrangement as being of any advantage. S.

50. HORSLEY opened the right mastoid in a girl, æt. seventeen, whose ear had been discharging since she was three years old. Two weeks before the operation the ear of that side lost its power of hearing entirely, and the surrounding parts became inflamed. Wilde's incision was performed, which liberated a quantity of fetid pus. The fever increased, nevertheless, whereupon the author opened the posterior portions of the antrum by means of a gouge. The posterior wall of the auditory canal was chiselled away, and thereby the tympanic cavity and the interior of the mastoid process changed into a single open cavity. The mastoid process was full of fetid pus. In spite of careful disinfection and iodoform dressing, the temperature line on the day following the operation showed the characteristics of pyæmia. Three days later there was severe precordial distress and dyspnoea lasting for half an hour. The patient now complained of severe pain in the region of the lower angle of the left shoulder-blade, where the physical signs of pulmonary embolism could be made out. Patient improved under antipyrin, and, at the end of three months, drainage could be dispensed with. S.

51. STEPANOW had occasion to observe a patient from whose left ear a sequestrum had been removed, which represented the upper $1\frac{1}{2}$ convolutions of the cochlea. On examining this ear with all the tones within the limits of perception, from the lowest to the highest, no tone-defect could be found. The hearing power for ordinary and whispered speech proved greater on the affected than on the sound side. The only anomalies that could be detected were a reversal of the result of Weber's experiment, and a shortening of the duration of the sound of a tuning-fork on bone-conduction. The author formulates the following conclusions :

(1) The destruction of the upper part of the cochlea does not involve the loss of perception of lower tones in man.

(2) This fact is sufficient to disprove Helmholtz' hypothesis, since there is no positive proof for it.

(3) The loss of the upper part of the cochlea does not produce tone-defects.

(4) It has no influence, at least no qualitative influence, upon the perception of ordinary or whispered conversation.

(5) From the preceding deductions it does not follow that the cochlea has nothing at all to do with the perception of sound, the same as it does not follow that the semicircular canals and am-

pullæ have nothing to do with the perception of sound, because hearing may be preserved when there is congenital malformation or necrosis of these parts, or after they have been cut experimentally.

(6) At present we lack as yet a base on which to assign the perception of different kinds of sound (tones, noises, and speech) to different parts of the labyrinth.

52. The autopsy in this case revealed the anterior and upper third of the right lobe of the cerebellum to be more or less disorganized; the vermis superior normal, though soft; floor of fourth ventricle normal. The pia at the base showed opacity about the large vessels, and there was a moderate amount of fibrinous and purulent exudation below the right post. portion of the hemisphere; ventricles of the hemispheres much enlarged, and their floors smooth. No localized or diffuse pachymeningitis. The hyperostosis of the roof of the tympanum the author is inclined to regard as unique.

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53. The patient was a woman, aged twenty-eight. She had, at two different times, attacks of furunculosis on left side, from which she apparently recovered. Closely following the last attack, however, there was a great deal of pain deep-seated in the head. There was no tenderness or redness over the mastoid, nor was there evidence of any material tympanic inflammation. There was slight elevation of temperature. W. heard on contact, and t.f. heard equally on both sides. She died, and a post-mortem examination showed evidence of intense inflammation over the entire extent of the arachnoid and pia-mater; an accumulation of pus in the ant. portion of the cerebellum; the left auditory and facial nerves embedded in pus; small abscess in anterior border of left cerebellar lobe; and the mastoid cells filled with purulent fluid; only slight evidences of tympanic inflammation.

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54. A general consideration of the whole subject is given, in which our existing knowledge of it is formulated, and six cases are given illustrative of the conditions. Case 1.—A man of forty, had scarlatina when a child; otorrhœa at times in right ear; pain on Jan. 1st over right mastoid; Wilde's incision; next day, brain complication, from which he died on the third day following. Autopsy showed caries of the roof of the tympanum, and an abscess of the brain over that part. Case 2.—A girl of eleven; otorrhœa with polypi in left ear, and an opening in the mastoid cells

from without ; facial paralysis. Under treatment, improved, and the mastoid fistula closed. In two months there was a return of pain and vomiting, drowsiness, constipation. Ophthalmoscope showed a slight neuritis. Died a few days after in convulsions. Autopsy : dura adherent over petrosum, and an ounce of pus in the cerebellum. Case 3.—A man forty years old ; otorrhœa of four years' standing, with polypi ; polypi removed ; exposure to cold ; cerebral symptoms followed by death. Case 4.—Woman, aged twenty-seven ; otorrhœa of several years ; fibrous granulations of tympanum ; pain and fetid discharge ; Wilde's incision, though no sign of mastoiditis, which revealed necrosis of the bone ; death. Autopsy showed an epitheliomatous growth springing from the petrosum. Case 5.—Boy, five and a half years ; acute otitis media ; right *Mt* not perforated ; child died, and caries of the roof of the tympanum was found, with extensive basilar meningitis. Case 6.—Girl of ten years ; otorrhœa ; polypi ; convulsions and pain ; death. No autopsy.

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55. Case 1.—Otitis med. pur. ; polypus ; facial paralysis ; pachymeningitis ; death. No autopsy. Case 2.—Ot. med. pur. complicated with lymphadenoma of the neck, resulting in caries of the atrium, attic, antrum, tympanic and auditory plates ; facial paralysis ; purulent meningitis ; death. On post-mortem examination, the inner wall of the attic was found to be gone, leaving the hor. semicircular canal exposed ; the wall of the antrum and adjacent cellules were eaten away ; the auditory plate was denuded and nearly loosened ; and a sinus existed between the antrum and abscess beneath the periosteum ; the annulus and tympanic plate were roughened ; on the inner surface there was an extensive opening along the line of the petro-squamosal suture, through which the inflammation probably passed to the brain.

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56. A description of the space known as the attic of the tympanum, taken from Leidy and illustrated by three drawings, is given. An account of the chronic form is first considered, and afterward the acute form. The treatment is such as the author usually follows in inflammation of the middle ear, placing reliance largely on internal remedies. Pain is treated by aconite, belladonna, pulsatilla, gelseminum, and suppuration is treated by small doses of mercury and calx sulph. In the more serious cases, he opens the cavity through the memb. flaccida, and inserts a piece of cat-gut for drainage purposes.

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57. VON STEIN employed Lucaë's massage of the ossicles of hearing by means of the elastic pressure-probe in thirty cases with the following results: (1) In three cases the probe-massage exerted no influence whatever upon the hearing faculty or upon the tinnitus. (2) In one female patient a tinnitus of many years' standing subsided after one month's employment of the massage, the hearing power not showing any noticeable improvement. (3) In the majority of instances only a moderate improvement of the hearing power resulted, whispered conversation being heard at the distance of about one meter, but the troublesome tinnitus decreased or disappeared altogether. (4) In four cases the hearing power was completely restored, but the subjective sensations persisted. In these cases, where the percipient organs were probably affected, the author had recourse to the tuning-fork treatment which proved very efficient.

58. MCBRIDE warns physicians not to be too rash in forming an unfavorable opinion in cases of hardness of hearing where bone-conduction is impaired and where there is more or less constant tinnitus. He relates the case of a patient who had been suffering from intense tinnitus for one year, and who had had several attacks of vertigo. There was greatly diminished bone-conduction on that side on which the hearing power was less. In the course of treatment, which was directed toward the naso-pharyngeal catarrh, from which the patient also suffered, the guarded character which the author had given to his prognosis proved to have been superfluous, since with the improvement of the catarrh the hearing power, the bone-conduction, and all the other symptoms also improved. While treatment was in progress, patient had a relapse of the naso-pharyngeal trouble, during which the bone-conduction became worse again, but this time the author had no misgivings about the significance of this symptom. His hopeful view was verified by the final result. A female patient had an attack of inflammation of the throat followed by tinnitus in both ears of several weeks' duration, and vertigo. The hearing power for the watch was $\frac{2}{3}$ on the right side, and $\frac{2}{3}$ on the left. Bone-conduction was abolished on the left side, the tuning-fork being heard on the right side only. In this case also the patient recovered after a few weeks' treatment of the middle-ear trouble by the ordinary methods. At the conclusion of the treatment the hearing power of both ears was equal, and the sound of a tuning-fork applied to the glabella was perceived equally on

both sides. A third case reported by McBride illustrates the negative value of the tuning-fork test, and also the fact that where both diminution of hearing and tinnitus are present, these two symptoms are not always to be considered as dependent upon one and the same cause. A female patient had been suffering from tinnitus in her left ear for eighteen months. Her hearing distance for the watch on this side was $\frac{1}{8}$, and bone-conduction was considerably diminished. On the right side aërial as well as bone-conduction was normal. Inhalation of ammonium chloride and applications of iodine to the mastoid process completely restored the hearing power as well as the bone-conduction of the left side, but the tinnitus remained. It depended upon the anæmic condition of the patient, and was successfully combated by preparations of iron. S.

59. The author believes that chronic aural catarrh is much more frequently accompanied by and dependent upon chronic rhinitis, than pharyngeal trouble. There are two forms, the hypertrophic and atrophic, each with definite aural signs and symptoms. The tinnitus is much more annoying in the atrophic form. The local treatment in such cases is to be addressed to the nasal mucous membrane, astringents and cleansing for the hypertrophic form; cleansing and stimulant for the atrophic. No form of the silver nitrate is to be used in the hypertrophic form, but is of value as a stimulant, particularly in the form of a powder, in the atrophic form. SWAN M. BURNETT.

THE LABYRINTH.

60. KIRK DUNCANSON. Mumps as a cause of sudden deafness. *Edinb. Med. Fourn.*, January, 1886.

61. Prof. KUNDRAT. Demonstration eines vollständig verknöcherten Labyrinthes. *Wiener med. Presse*, No. 17, 1886.

62. Dr. J. HABERMANN. Zur Kenntniss der Otitis interna. *Zeitschr. f. Heilkunde*, 1886, Heft 1.

60. KIRK DUNCANSON adds a new case to those recently published by others, of sudden deafness in consequence of a severe attack of mumps. Contrary to general experience, according to which the deafness acquired in this way remains unchanged, Duncan's case in the course of time showed a slight improvement. S.

61. KUNDRAT's specimen was taken from a man æt. thirty, who ten years before his death had met with an injury to his

skull, followed by purulent discharge from his right ear. Head-ache and vertigo came on later and he became totally deaf on the right side. The autopsy revealed an old encysted abscess of the right cerebellar hemisphere extending on one side as far as the external auditory canal. The right temporal bone was much coarser in shape than the left, the edges having become rounded. On section of the petrous portion osseous obliteration of the labyrinth was found. H.

62. HABERMANN's minutely described case of secondary sup-puration of the labyrinth by propagation from the brain is a welcome addition to a number of analogous cases hitherto published by others. He had occasion to make the post-mortem examination of a boy who had become deaf in the course of meningitis, from which disease he subsequently died. According to the author's view the inflammatory agent which caused the meningitis had proceeded from the subarachnoidal space through the lamina cribosa and the aquæductus cochleæ into the perilymphathic space of the labyrinth. S.

THE NOSE AND NASO-PHARYNX.

63. Dr. ZIEM, of Danzig. Ueber die Ursachen der Anschwellungen der Nasenschleimhaut. (On the cause of the turgescence of the nasal mucous membrane.) *Allgem. med. Centralzeitung*, Nos. 16 and 17, 1886.

64. Dr. ZIEM, of Danzig. Ueber Bedeutung und Behandlung der Naseneiterungen. (On the significance and treatment of suppurative rhinitis.) *Monatsschr. f. Ohrenh.*, Nos. 2, 3, and 4, 1886.

65. Dr. J. F. NEUMANN. Ueber die Anwendung der Chromsäure und der Galvanocaustik in der Nase und in dem Rachen. (On the employment of chromic acid and the galvano-cautery in the nose and pharynx.) *St. Petersburger med. Wochenschr.*, No. 3, 1886.

66. Dr. ZIEM, of Danzig. Ueber das Zusammentreffen von Trachom der Bindehaut mit Catarrhen der Nasenschleimhaut. (On the connection between trachoma of the conjunctiva and catarrh of the nose.) *Allg. med. Central-Zeitung*, No. 23, 1886.

67. Dr. T. BOBONE, in San Remo. Un caso di spasmo sternutatorio. (A case of spasmodic sneezing.) *Bollettino delle malattie dell' orecchio*, etc., No. 4, 1886.

68. Prof. HACK, of Freiburg i. B. Zur operativen Therapie

der Basedow'schen Krankheit. (On the operative treatment of Graves' disease.) *Deutsche med. Wochenschr.*, No. 25, 1886.

69. Dr. E. BAUMGARTEN, of Budapest. Die Epistaxis und ihre Behandlung vom rhino-chirurgischen Standpunkte. (The treatment of epistaxis.) Vienna, 1886. Toeplitz und Deuticke.

70. Dr. SCHMIEGELOW. Om Stendannelse i Næsehulen. (On rhinoliths.) *Nord. med. Arkiv*, Bd. xvi., No. 16.

71. W. HUBERT, in Heidelberg. Ueber die Verkrümmung der Nasenscheidewand und deren Behandlung. (On the treatment of deviations of the nasal septum.) *Münchener med. Wochenschr.*, Nos. 18, 19, and 20, 1886.

72. Prof. COZZOLINO. Deviazione del setto nasale, delle ossa e cartilaggini nasali. (Deviation of the nasal septum.) *Il Morgagni*, 1886, fasc. 3.

73. Prof. COZZOLINO. Il lupus primitivo della mucosa nasale. (On primary lupus of the nasal mucous membrane.) *Archivi italiani di laringologia*, 1886.

74. Prof. COZZOLINO. Catarro faringo-nasale artritico. (Gouty catarrh of the naso-pharynx.) *Bollettino delle malattie dell' orecchio*, No. 4, 1886.

75. Dr. M. BROICH, of Hanover. Ein kurzer casuistischer Beitrag zu Tornwaldt's Beobachtungen über Erkrankung der Bursa pharyngea. (On disease of the pharyngeal bursa.) *Monatsschr. f. Ohrenheilk.*, Nos. 5, 6, and 7, 1886.

76. Dr. KEIMER. Casuistische Mittheilungen über die Erkrankungen der Bursa pharyngea. (On disease of the pharyngeal bursa.) *Monatsschr. f. Ohrenheilk.*, Nos. 3 and 4, 1886.

77. Dr. J. GOTTSTEIN. Zur Operation der adenoiden Vegetationen im Nasenrachenraum. *Berliner klin. Wochenschr.*, No. 2, 1886.

78. Dr. B. LOEWENBERG. Ueber Exstirpation der adenoiden Wucherungen im Nasenrachenraume nebst Beschreibung eines neuen Instrumentes zu dieser Operation. (A new instrument for the extirpation of adenoid vegetations of the pharynx.) *Deutsche med. Wochenschr.*, No. 16, 1886.

79. Dr. H. CHATELLIER. De quelques accidents qui accompagnent les tumeurs adenoïdes du pharynx. (On certain symptoms accompanying adenoid vegetations.) *Annales des maladies de l'oreille*, etc., No. 1, 1886.

80. Prof. GRANCHER. Un nouveau signe des tumeurs adenoïdes du pharynx nasal. (A new symptom of adenoid vegetations.) *Annales des maladies de l'oreille*, etc., No. 5, 1886.

81. Dr. LICHTWITZ. Des troubles de la voix articulée dans les affections du voile du palais, de la cavité naso-pharyngienne et des fosses nasales. (Disturbances of articulation in affections of the palate, etc.) *Revue mens.*, No. 4, 1886.

82. M. KIRMISSON. Tumeur neoplastique des fosses nasales. (Tumor of the nasal cavity.) *Gaz. des Hôpit.*, No. 3, 1886.

83. M. TILLAUX. Fibromyxome du pharynx nasal. Extirpation par la voie palatine. (Extirpation of a nasal tumor through the palate.) *Gaz. des Hôpit.*, No. 2, 1886.

84. M. CHURCHILL. Post-nasal fibroma in a child. *The Lancet*, Vol. 1, No. 4, 1886.

85. Dr. CAPART, of Brussels. Polypes fibreux naso-pharyngiens. Guérison par l'électrolyse. (Fibrous polypi of the naso-pharynx cured by electrolysis.) *Communications faites à l'académie*, 29 mai, 1886.

63. ZIEM points out that where there is persistent obstructive tumefaction and suppuration of the lining membrane of the nose, not dependent upon an affection of the hard structures of the septum, or of one of the conchæ, a focus of suppuration ought to be looked for in one of the accessory cavities of the nose. If this focus then be eliminated by appropriate measures, the obstruction and suppuration of the nasal fossa proper will remedy itself.

The turgescence of the erectile tissue of the nose dependent upon the presence of hypertrophied tonsils, or of tumors or vegetations of the naso-pharyngeal space, cannot be properly explained by nervous reflex, but only by venous congestion in consequence of impaired respiration. Cysts may form an exception, as the tension of the liquid contained in them may cause erection of the cavernous tissue by reflex irritation.

Enlarged tonsils or naso-pharyngeal vegetations, by impeding the movements of the pharyngeal muscles, and those of the palate, may retard the discharge of the contents of the posterior nasal veins into the pharyngeal and palatine veins, and thus act as local obstructions to circulation. S.

64. ZIEM penetrated the maxillary cavity through the alveolar process 37 times in 23 persons suffering from chronic suppurative rhinitis, acting on the supposition that the rhinitis was

dependent upon disease of the mucous lining of the antrum, and actually encountered pus there 29 times, *i. e.* in 78 per cent. of the instances. From these observations he draws the conclusion that if more attention were paid to the maxillary cavity in chronic suppurative rhinitis, better results would follow.—According to Ziem, the sources of chronic suppurative rhinitis are the following: (1) Local inflammation of the mucous membrane of the nose. (2) Possibly also a general affection of this membrane. (3) Disease of the mucous membrane of the accessory cavities of the nose. (4) Disease of the bony structures of the nose and accessory cavities. (5) Affections of the teeth. All these sources may act either singly or in combination. The clinical symptoms of disease of the accessory cavities, as given by the text-books, are of little value. This must be said especially of the symptoms alleged to be present in disease of the maxillary cavities, such as tumefaction of the corresponding half of the superior maxillary bone, increased discharge of pus when the patient is lying on the opposite side, and pain and swelling of the cheek of the affected side. The first symptom, that of tumefaction of the bone, Ziem never saw in a single instance. In two of his cases there was no increased flow of pus when the patient was lying on the opposite side. Pain was present in two instances only, and swelling of the cheek in only one case of those operated upon by Ziem. A considerable quantity of pus may be present without producing a single one of the symptoms just enumerated. S.

65. NEUMANN melts chromic acid in a small spoon which is set at an angle to its handle. He brushes the parts with a five-per-cent. solution of cocaine before employing the acid, and afterwards with a solution of soda. The patient is made to drink soda- or Seltzer-water both before and after the operation. He has never observed vomiting.

66. ZIEM, in contradicting Scheff's assertion that nasal disease may be the consequence of ocular trouble, quotes Stoerck and Horner as authorities who hardly ever saw the affections of the conjunctiva extended to the nasal mucous membrane.

67. BOBONE had occasion to observe sternutatory spasm in the case of a girl eight years old, which was so violent, that on two occasions it threatened the life of the little sufferer. The spasm made its appearance in the latter stage of an attack of pneumonia. The sneezing spells, which first came on at long intervals only,

soon began to follow each other in rapid succession, so as not to leave the patient time to complete her inspirations. Lachrymation and profuse watery discharge from the nostrils were concomitant symptoms. The girl finally became cyanosed, and fainted from exhaustion. The spasm now subsided, and regular respiration was resumed. Soon, however, the sneezing spells reappeared, at rarer intervals at first, but gradually becoming more violent again, and in the evening of the same day she had another fainting fit. Bobone ordered repeated applications of a ten-per-cent. solution of cocaine, whereupon the sneezing spells began to subside, and there was no more fainting fit. On inspection of the nasal cavity, the entire tract of the lining mucous membrane proved to be highly congested. The covering of the lower turbinated bones was so much swollen as to touch the septum on either side. S.

68. The lady whom HACK cured of Graves' disease had from early childhood been suffering from marked bilateral exophthalmos, as well as from a tendency of her nostrils to become obstructed, and later on also from palpitations of the heart and swelling of the thyroid gland. On examining the nose, Hack found marked hyperplasia of the erectile tissue of the middle and lower turbinated bones. After cauterization of the erectile body of the right lower turbinated bone, the exophthalmos of that side was found the next day to have almost completely disappeared, and the same effect was produced on the other side by cauterizing the left lower turbinated erectile structure. In the course of time the palpitations also ceased, and the area of cardiac dulness became reduced to normal limits. H.

69. BAUMGARTEN'S monograph contains a general review of old and new theories and observations concerning epistaxis. Its causes, prevalence, and treatment are accurately discussed, and the author's personal observations, which, however, do not seem to have been very numerous, are used as appropriate illustrations. Baumgarten uses strips of iodoform-gauze for plugging purposes. Only the actual or the galvano-cautery are considered as adequate means for destroying the bleeding points which are the sources of epistaxis. H.

70. SCHMIEGELOW relates the history of a man, *æt.* fifty-eight, who had been annoyed for sixteen years by the presence of a large rhinolith in his left nostril. He was cured by lithotripsy. The symptoms had been a sensation of fulness, a profuse, fetid discharge from the nostril, and one-sided perspiration of the

head, the latter symptom being considered as a reflex neurosis by the author. The concretion consisted mainly of the phosphates of calcium and magnesium. A general review of the subject is added.

71. In treating of the several methods that have been proposed for straightening deviated nasal septa, HUBERT points out that these deviations are of varying shape and degree, and that in some cases an orthopedic treatment will be found appropriate, whilst in others operative interference will be indicated. The author describes two new methods employed by Jurasz. One of these consists in the removal of the projecting portion of the septum by means of the galvano-cautery [this has already been proposed before by Voltolini—H.], and the other in the introduction, daily repeated, of cotton plugs into the obstructed nostril. The latter method is indicated especially in recent cases of deviation of traumatic origin. H.

72. COZZOLINO has employed the instrument devised by Jurasz for straightening deviated septa in eight cases, and in each with satisfactory results. In order to maintain the corrected position of the septum, the author employed Adams' plugs, only substituting rubber for ivory. He considers the substituted material to be less irritating to the nasal mucous membrane. In almost all of his cases from two to three days proved a sufficient length of time for the plugs to be left in to insure permanency of the correction. S.

73. Within the course of eight months COZZOLINO observed five cases of primary lupus of the nasal mucous membrane. As regards the etiology, diagnosis, and treatment of this affection, he has formed the following views: There is doubtlessly a form of lupus primarily attacking the nasal mucous membrane, principally that portion covering the cartilaginous septum. Primary lupus of the nasal mucous membrane is more frequent than lupus of any other mucous membrane. It may be mistaken for late or hereditary syphilis, especially if perforation or total destruction of the cartilaginous septum has taken place. Lupus of the mucous membrane has marked characteristics, and after once seen, can never afterwards be mistaken for any thing else. The only rational treatment for it is the same as that employed for lupus of the skin, namely, the local one. The nodules ought to be destroyed by the galvano-cautery, and the nasal passages properly cleansed and disinfected. Any other kind of treatment will prove

useless, and will not prevent the extension of the morbid process, which has a tendency to spread rather on the surface than to penetrate the deeper tissues. Every dermatologist ought to consider it his duty to examine the mucous membrane of the upper air passages in every case of lupus of the face, and especially of that of the integument of the nose. If this were done, primary lupus of the nasal mucous membrane will cease to be considered such a rare affection as it has been hitherto. S.

74. On the strength of two observations of naso-pharyngeal catarrh in gouty subjects, with abundant production of scabs of leathery consistence, COZZOLINO has come to the conclusion that the existence of the gouty form as a distinct variety of naso-pharyngeal catarrh is well established. The existence of such a form has been maintained by French authors generally. Besides these Cozzolino also quotes Mackenzie as an authority in favor of this view, but in this he is mistaken. Mackenzie mentions the fact that a connection between the gouty diathesis and catarrh of the naso-pharynx has been assumed by a certain English and an American author, but he himself considers the existence of such a connection as improbable. S.

75. BROICH succeeded in 20 p. c. of all cases of disease of the pharynx or of the naso-pharynx that came under his observation, to trace the cause to a catarrh of the pharyngeal bursa, but he has never been able as yet to detect a cyst in that locality. The eight cases which are published by Broich with full details, tend to prove that disease of the pharyngeal bursa as described by Tornwaldt is not a rare affection, and that this affection is capable of producing very serious discomfort. The employment of posterior rhinoscopy with the aid of Voltolini's palate hook rendered the diagnosis easy. The treatment was followed by good results in almost every case. In opposition to the opinion recently enunciated by Keimer, Broich thinks that bursitis pharyngea does not originate spontaneously, but is the consequence of acute or chronic nasal or naso-pharyngeal affections. S.

76. KEIMER publishes eight observations tending to corroborate the picture drawn by Tornwaldt of affection of the bursa pharyngea, and in which he relieved the patients by means of the treatment advised by the latter author. Regarding affections of the nose as associated with bursitis pharyngea, Keimer differs from Tornwaldt in not regarding them as secondary to the affection of the bursa. After the symptoms caused by the latter affec-

tion had been cured, he found that the nasal trouble still remained behind, and that he had to treat it separately in order to get rid of it. From this circumstance he draws the conclusion, contrary to Tornwaldt's theory, that the changes in the nasal mucous membrane are not the consequence, but the cause of the affection of the bursa.

Keimer also relates one case which presented all the symptoms of bursitis pharyngea, but where there was no bursa present. The continued formation of "oyster shells" in the usual situation of the bursa depended on chronic rhinitis. The presence of "oyster shells" alone will therefore not appear to be sufficient evidence of the existence of a bursa; the diagnosis can be established safely by means of a probe only. S.

77. GOTTSTEIN publishes the description of an instrument for the removal of adenoid vegetations of the naso-pharynx. It is somewhat similar to the fenestrated curette devised by Lange, but differs from it mainly in that the cutting part is made to work in a frontal instead of in a sagittal plane.

78. The fenestra of LÖWENBERG's curette is covered by a movable guard, which is to be withdrawn only after the instrument has been brought in opposition to the parts intended to be attacked. The object of the guard is to protect the sound parts from unintentional injury.

79. The concomitant symptoms of adenoid vegetations are the following, according to CHATELLIER: (1) Inflammation. He has found more or less distinct traces of inflammation in every case observed by him. (2) Pharyngitis under the form of pharyngitis granulosa. (3) Deformities of the nose. (4) Deformities of the chest. The disappearance of all of these symptoms after removal of the vegetations of the naso-pharynx proved that they had all been depended upon the presence of these growths. H.

80. GRANCHER draws attention to the difference in the mode of respiration in patients troubled with adenoid vegetations, according to whether they respire with their mouths open or closed. In the first instance the type of respiration is costo-diaphragmatic; in the latter, however, it is of the supero-costal type only, the supply of air is insufficient, and on auscultation the vesicular breathing will be found feeble and indistinct. H.

81. In the introduction to his paper LICHTWITZ discusses the physiological part played by the soft palate in articulation. He points out that not sufficient distinction is made between the

several kinds of disturbance of articulation caused by pathological processes affecting the parts concerned in articulation.

Following Kussmaul our author distinguishes *rhinolalia clausa*, which takes place when the nose and the naso-pharynx are shut off from the lower part of the pharynx, and *rhinolalia aperta*, which occurs when the communication between these parts remains open at those times when it ought to be closed. In *rhinolalia clausa* the passage of the sound waves is obstructed. Such an obstruction may exist with or without any narrowing of any of the cavities concerned in the production of articulate sounds. *Rhinolalia aperta* can be observed in cases of perforation, paralysis, or paresis of the palate, of œdema or infiltration, of mechanical impediments of mobility, and of congenital atrophy and consequent insufficiency of the velum. H.

82. KIRMISSON relates two cases in which malignant growths in the nasal passages were mistaken for simple polypi and treated accordingly. He points out the danger involved in such mistakes, and throws out a few hints concerning the differential diagnosis. There is also the report of a case of a tumor which had originated from the septum near the external orifice, and which was removed by means of the galvano-cautery. S.

83. TILLAUX relates an operation made for the removal of a tumor of the naso-pharynx which had grown from the posterior extremity of the lower part of the septum, and in which the velum had to be divided in order to gain access to the new growth. There was perfect recovery at the end of ten days, the cut wound of the palate having united at the end of the fifth day already. On microscopical examination the smaller or nasal portion of the tumor proved to be of myxomatous, the remainder or pharyngeal portion to be of fibromatous character. S.

84. CHURCHILL exhibited, before the Pathological Society of London, a fibroma which he had removed from the naso-pharyngeal space of a boy, eight years old. It had been attached by a pedicle to the upper surface of the velum, and had two finger-shaped projections which had extended almost to the nostrils. The tumor had been hanging down so as almost to reach the upper aperture of the larynx, and had evidently interfered with the proper development of the child. Microscopical examination showed a fine reticulum composed of narrow fibrous threads and some myxomatous tissue. The myxomatous character was more pronounced in the two projections mentioned before. S.

85. CAPART reports two cases of large fibrous polypi of the naso-pharyngeal space cured by electrolysis. In one case, fruitless attempts had been made to remove the tumor by Gussenbauer's operation, in which access is gained to the tumor by temporary resection of the hard palate and the velum. It was cured by electrolysis within two months. In the other case seven sittings proved sufficient to eliminate a large-sized tumor. The application of electrolysis is very simple, two electrodes being introduced into the new growth from in front, and a third from behind by the way of the mouth and the pharynx. As a rule, from four to six elements sufficed. The sittings were of from ten to twenty minutes' duration.

H.

Reviews.

Die Krankheiten der Nasenhöhlen, ihrer Nebenhöhlen und des Nasenrachenraumes mit Einschluss der Untersuchungstechnik. Zum Gebrauche für Aerzte und Studirende. Von Dr. WILHELM MOLDENHAUER, Docenten an der Universität Leipzig. Leipzig: 1886. Verlag von F. C. W. Vogel.

The Diseases of the Nasal Cavities, of the Accessory Cavities of the Nose, and of the Naso-Pharynx. By Dr. WILHELM MOLDENHAUER. Reviewed by A. Hartmann, of Berlin.

In this book of 198 pages Moldenhauer has attempted to give a brief and succinct résumé of the pathology of the nasal cavities and the naso-pharynx, laying special stress upon a faithful reproduction of actual appearances. This task he has solved admirably, the style of the work being remarkable for clearness and precision, whilst theoretical speculations are carefully avoided. He shows himself to be an acute observer, and well qualified by extensive experience to give us a faithful picture of the diseases of the nose and the naso-pharynx, and of their treatment. Where the author's views differ from those generally held, there is ample justification for such difference.

The subject-matter is systematically divided into several chapters, which are preceded by an introductory essay on the anatomy and physiology of the parts. For the examination of the nose Moldenhauer recommends the Duplay-Charrière speculum. Zaufal's funnels he considers to be useful in exceptional cases only. In the chapter on general therapeutics the several methods of treatment are accurately described. He emphatically condemns the indiscriminating use of the nasal douche, which is the cause of so much mischief. In speaking of the operative correction of the deviated septum, he points out that this procedure is often rendered more difficult from the fact that the external aperture of the

nostril is placed at a higher level than the lower limit of the deviation. In order to gain better access under these conditions Moldenhauer incises the lower rim of the nostril, and extends the cut in the direction of the naso-labial fold.

In the treatment of acute coryza we miss the mention of cocaine, which not only relieves the distressing symptoms caused by obstruction of the passages, but also in many instances aborts the morbid process altogether. In treating of chronic fetid rhinitis the author insists that simple ozæna ought not to be brought in connection with chronic catarrh, and in this matter our own observations tend to bear out Moldenhauer's view. The supposition that *rhinitis atrophicans* is the final stage of chronic hypertrophic catarrh, is entirely arbitrary. Moldenhauer thinks that it would be more honest and at the same time more scientific to acknowledge that we know too little as yet of the etiology of fetid rhinitis.

The neoplasms of the nose and the adenoid vegetations of the naso-pharynx are minutely described in the following chapters, and the author's own conclusions, derived from an extensive practice, are well set forth. As regards the origin of reflex neuroses Moldenhauer adopts Hack's theory, that "the turgescence of the cavernous tissue of the lower turbinated bones, whether permanent or only transitory, plays an important part in the transmission of so-called secondary reflexes."

We have pointed out a few only of the most salient features of Moldenhauer's treatise, and have not given an adequate idea of the value of its contents. We recommend this book to everybody who is interested in the study of the diseases it treats of, and are convinced that beginners as well as experienced practitioners will read it with profit, and gain many valuable suggestions from its pages.

Reference Hand-Book of the Medical Sciences. New York: Wm. Wood & Co. Vol. II., 1886. (Sold only by subscription.)

In regard to this second volume, we can but reiterate what we said in commendation of the first. It is a work useful for the general physician and surgeon to have, on account of the value of the special articles, and equally of value to the specialist for the papers on the other branches of medicine outside his own. All the articles on otology in this volume are written by men whose names are well-known, and some of them are of peculiar excellence.

The first paper, on "Deaf-Mutes," by Prof. E. A. Fay, of the National Deaf-Mute College, is worthy of the most careful perusal. It is exhaustive in its statistical presentations, from every point of view, giving the extent of deaf-mutism, the causes—consanguinity of parents, maternal impressions, scrofula, social circumstances, mountainous regions, diseases and accidents,—mental condition and characteristics of the deaf-mute, morbidity, their mortality, etc., with a full account of the origin and growth of schools and methods, with a consideration of alphabets and visible speech. Prof. Gallaudet contributes an interesting and instructive appendix to this paper, on "The Language of Signs and the Combined System of Instructing Deaf-Mutes." "The Anatomy of the Labyrinth of the Ear" is treated of by Wm. G. Thompson, with ten fairly good illustrations. "The Development of the Ear" is given by C. W. Minot in his characteristic clear and exhaustive manner, with nineteen drawings. Huntington Richards explains the methods of examining the ear for diagnostic purposes. The "General Therapeutics of the Ear" is by the editor, Dr. Buck, discussing (1) measures for controlling pain, in which he condemns most heartily the mild measures adopted by some, believing in the heroic methods of abstraction of blood, paracentesis, and the hot douche; (2) measures for arresting a discharge from the ear, which consist in the well-known and generally employed remedies. "Non-Suppurative Inflammations of the Tympanum" are considered by D. B. St. J. Roosa. In the treatment of the chronic form the author laments, as we all do, the inefficiency of treatment. He relies but little on mere local treatment, having had better success with a change of climate. He thinks Georgia and North Carolina (and the reviewer would add, South Carolina) the best climates for such patients. "Purulent Inflammations of the Tympanum" is an exhaustive treatise of forty pages by J. Orne Green, a short abstract of which could not do justice to the original. Every otologist could read it with profit. A diagram is given of the brain sinuses and their connections, which is of great value in tracing the path of phlebitis of the emissary vein. "The Anatomy, Physiology, and Diseases of the Eustachian Tube" are treated of by Gorham Bacon.

S. M. B.

Lectures on Clinical Otology, Delivered before the Senior Class of the Homœopathic Medical College. By HENRY C. HOUGHTON, M.D. Boston: Otis Clapp & Son, 1885. Pp. xiv. + 260.

This book, being written for students, contains but little to interest the special practitioner, except as it records the experience of an intelligent and honest man. There is nothing new offered in the way of pathology ; and its therapeutics, so far as concerns the internal administration of medicines, is strictly homœopathic ; and there is a very extensive appendix, containing a summary of remedies which are believed to be valuable in the treatment of the various symptoms. The book is pleasantly written and well printed. The author manifests his appreciation of the work done in otology by Dr. Roosa by dedicating his work to him.

SWAN M. BURNETT.

On the Importance of the Bursa Pharyngea in the Causation and Treatment of Certain Diseases of the Naso-Pharynx. By Dr. G. H. TORNWALDT, Dantzig. Wiesbaden : J. F. Bergmann. 119 pages. Review by Dr. E. Schulte. Translated by J. A. Spalding, M.D., Portland, Maine.

Since Meyer's remarkable work on adenoid vegetations of the naso-pharyngeal space, some twelve years ago, Tornwaldt's treatise is the first to offer us genuine and serviceable material for the erection of a fundamental pathology of this region. And how much our therapeutics will gain from this book is easy to see, when we reflect that in the future our task in a number of naso-pharyngeal affections will not be simply to care for the individual symptoms, but to attack at once the demonstrated anatomical cause of the whole series, and to terminate them by means of a few manipulations, which can, of course, only be performed successfully by a well-trained hand.

The author was able to refer a large number of cases of naso-pharyngeal, or simply nasal, catarrh to pathological alterations in the bursa pharyngea, which was first described in 1842 by F. J. C. Maier. This structure he was able to render visible at any rhinoscopic examination by elevating the uvula with Voltolini's hook. In so doing, he always found in a line projected backward from the nasal septum, and about half way between the upper end of the septum and the anterior tubercle of the atlas, an opening in the mucous membrane, which, in its appearance and situation, corresponded precisely to the entrance of the bursa pharyngea as described by Luschka.

The opening and the sac (which varies, of course, in size in different persons) are so constant, that Tornwaldt considers their absence an abnormality.

The pathological alterations of the sac as at present observed consist in hypersecretion, with the production of a mucous or generally of a purulent secretion, the latter having rarely any offensive odor. Sometimes, however, the bursa is transformed into a cyst, as has already been described by Luschka, Troeltsch, and Czermak. This condition may be diagnosticated whenever a cyst is found in the middle line of the roof of the naso-pharynx, in the situation of the orifice of the bursa pharyngea, which itself in turn cannot be discovered.

The morbid symptoms which represent the natural sequences of the abnormal secretion or the formation of the cyst are, on the one hand, the disagreeable sensations which the affection produces at the precise location of the bursa, such as dryness, burning, the presence of some foreign body, pain in the pharynx, a frequent desire to swallow or to clear the throat, obstruction to nasal breathing, and a dissonant nasal voice. On the other hand, we have the accessory symptoms of morbid sensations in adjacent parts, such as alterations in the mucous membranes, diseases of the ears, granular pharyngitis, chronic laryngitis (the intra-arytenoid portion being chiefly affected), bronchial catarrh, catarrh of the stomach, coughing without any demonstrable disease of the lungs or larynx, bronchial asthma, breast pains in the region of the manubrium sterni, and headache in the back of the head and neck, or in the forehead.

The treatment which Tornwaldt employed for the relief of the hypersecretion consisted in careful removal of the secretion, insufflation of silver nitrate, tannin, or alum, with a patent condition of the orifice; but if this were constricted, silver probes tipped with silver nitrate were introduced, or solutions of the same were syringed in, or pure tincture of iodine was applied with a fine platinum canula. If success was not thus attained, the galvano-cautery was employed, one application generally sufficing to reduce the secretion for several days. Occasionally the cauterization had to be repeated several times before the bursa was entirely destroyed and the secretion totally removed, whilst in a few rare cases this method failed to relieve the symptoms permanently.

All cysts in the bursa were opened with a knife-shaped cautery, and if, despite this, the secretion continued, and could not otherwise be stopped, the sac was destroyed with the galvano-cautery.

The new facts communicated by the author are illustrated by twenty-five detailed cases, all of which testify in favor of Torn-

waldt's theory of the cauterization of many naso-pharyngeal diseases.

A careful reading of this treatise inclines us to express the wish and hope that in all cases of naso-pharyngeal catarrh the precise treatment advocated by the author may everywhere be sagaciously imitated. The time, then, will not be far when the expression "naso-pharyngeal catarrh" will have disappeared entirely from our terminology.

Hand-Book of Otology, for Students and Physicians.

By Dr. WILHELM KIRCHNER, Wuerzburg. With thirty-nine woodcuts. Published by F. Wreden, in "Wreden's Collection of Short Works for Medical Instruction." Reviewed by Dr. H. Steinbruegge, in Giessen. Translated by J. A. Spalding, M.D., Portland, Maine.

It is a well-known fact, that despite the inferior position into which the medical profession would gladly push otology, in comparison with the other preferred and more crowded specialities, yet practical physicians and medical students confess, with more or less publicity, that they would like to know more about the science of the ear, and the manner in which its diseases should be treated and the essential operations be performed. But the practitioner is burdened with his patients, and the student with apparently more important studies; the new specialty must not take up too much time or labor. Hence, in most cases, all that is necessary, in the eyes of the bold practitioner, is a course of a dozen hourly lectures and an india-rubber bag, to enable him to treat all diseases of the ear, or, at least, all that are acute in origin and course.

It sometimes seems as if we ought to put a stop to all these compendiums of otology. What is the use of continuing to hatch out new and ever-new broods of mere dilettanti in an art which demands, at the start, a fundamental knowledge of anatomy, then deep physiological investigations, and finally assiduous practice and frequent necessary manipulations for years, before any physician can become a virtuoso in this specialty.

If now we bid a sincere welcome to Kirchner's book, it is simply because the treatise contains a perfect compilation of all that is important in modern otology. Although there may be a trifle too much of operative technique for the beginner, this mere superficiality is highly to the advantage of those who are practised in the specialty of the ear. For this reason chiefly, we feel that the

author is entirely too modest, when, in the preface, he recommends his treatise to students and practitioners in medicine, whilst, in reality, even the most cultivated otologist cannot fail to find in these pages an extremely desirable recapitulation of all the remedies and operations that experience and practice have tried and proved, while, at the same time, all unnecessary ballast or padding has been thrown overboard. And one of the nicest qualities of the whole is that we can read its two hundred pages without meeting with offensive interruptions in the shape of long passages in fine print and frequent foot-notes.

A short introduction leads us to the first of the seven sections into which the book is divided, in which are described the examination of the ear and naso-pharyngeal space, the tests for hearing, the use of the air-douche and catheter ; later on, in sections, each beginning with a brief anatomical introduction, we are taught the pathology and treatment of the diseases of the ear, divided, according to the generally-accepted doctrines, into those of the external, middle, and internal ear. We must, however, at this place take occasion to state that we heartily agree with the author when, in his preface, he says that this subdivision is of no real value, except for the facility with which the various topics can be glided through, and that no such local distinctions really exist, for the very reason that the cavities of the so-called middle ear really extend into the districts supposed to belong to the external or internal ear. We might be tempted additionally to say that in morbid conditions the membranous and ossified walls which separate the anatomical subdivisions so artificially created, often give the disease a greater chance to spread than a means for cutting it short ; that the entire organ of hearing forms a physiological unit ; and, finally, that the morbid disturbances of nutrition which affect one portion of the organ will ultimately, at least to a certain degree, affect the rest by sympathy or extension.

Such reflections as these are frequent enough when we read over, in the numerous treatises of otology, the finical chapters on otitis externa diffusa, on myringitis, on isolated affections of the tube, or, further still, when we attempt to follow the efforts, directed with so much skill and waste of time, to define the delicate distinctions which exist between the diseases of the so-called middle and inner ears, when in reality many of them may never be seen except in the rarest of cases. It is, therefore, appropriate to warn the beginner in otology of the imperfection of the anatomi-

cal subdivisions of the distance to which isolated diseases of various localities may extend, and to call his attention to the frequency of combinations in diseases of the organ of hearing.

The most comprehensive fifth section of Kirchner's text-book contains the diseases of the tympanum, the complications with affections of the mastoid process, meningitis, polypi, formation of cholesteatomata, and the tropho-neuroses. We see here, with pleasure, that the author has retained the old and simple, yet so practical, subdivisions, of the diseases of the tympanum, into the acute and chronic catarrh and acute and chronic suppuration of the tympanum. The treatment insisted upon is quite active and energetic; also in the acute cases, and is doubtless based on his own experience.

One of the most important things insisted upon is, that in acute affections of the ear the patient should be carefully attended and rested, and spared from any excitement. For many a physician have I seen stand amazed in ignorant astonishment when a patient with simple catarrh of the tympanum or a perforation of the membrana tympani has been urged to keep in the house, or even to go to bed. Too true it is, that this is the common idea of the neglectful way in which diseases of the noble organ of hearing may be treated.

The sixth section contains the diseases of the labyrinth, Ménière's complex of symptoms, and hysterical paralysis of the auditory nerve. The seventh treats of deaf-mutism, simulation of deafness, and of hearing-trumpets. The text is interspersed with thirty-nine excellent wood-cuts, partly anatomical, partly prefiguring instruments. The type and paper are excellent. The few errata will, of course, be corrected in a second edition. And thus, with great pleasure, we call the attention of our colleagues, and of the profession generally, to Kirchner's "*Hand-Book of Otology*," and hope that it may meet with extensive sale not only in Germany, but even in distant lands.

MISCELLANEOUS NOTES.

U. PRITCHARD, of London, has been chosen to fill the newly established chair of otology at King's College, London.

In Memoriam.

PROFESSOR DR. ALBERT BURCKHARDT-MERIAN,
OF BASLE,

died after a long and painful illness, in consequence of endocarditis, before completing the forty-fourth year of his life.

In the deceased we have lost a colleague who was an excellent man in every sense. Being of a genial, open-hearted, and amiable disposition, he won the sympathy of everybody who came in contact with him, and never afterwards lost it. He was an ardent student and an efficient and conscientious practitioner. He did faithful work as author, teacher, and physician, and was much beloved by his patients as well as by his students. He not only was a diligent writer himself, but also stimulated his pupils to much valuable work. He was a warm-hearted colleague. Being always led by ideal aspirations, he did not allow himself to be restricted by the narrow limits of his specialty, but bore himself on every occasion as a champion of the interests of the whole medical profession.

In conjunction with Dr. Bader he founded and edited the highly esteemed *Zeitschrift Schweizer Aerzte*.

It was through his efforts that the regular meetings of South-German and Swiss Otologists were inaugurated and successfully kept up, and it was from his individuality that these meetings received the charming impress of harmony and sociability. Those who have hitherto taken part in these reunions will sadly miss him in the future.

The members of the Third International Otological Congress will remember with gratitude how diligently he labored for the successful organization of the Congress, and how much ability and tact he displayed as its presiding officer.

Moos.

HEIDELBERG, November, 1886.

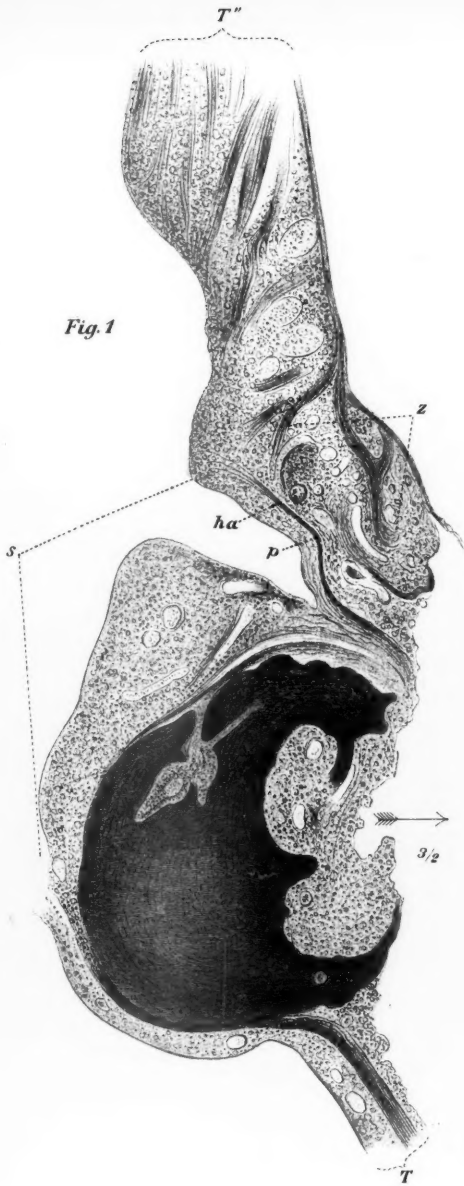
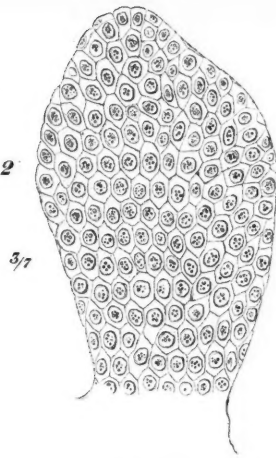


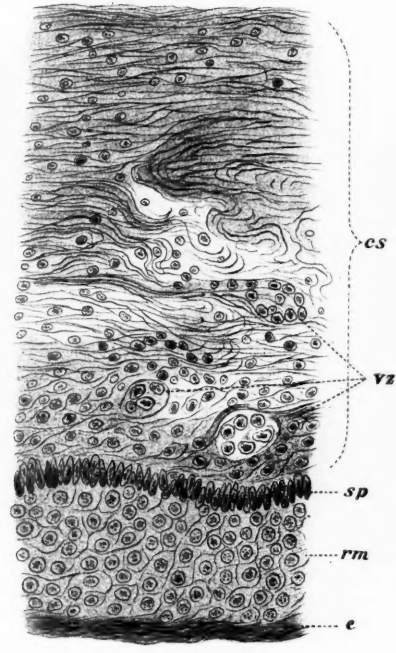
Fig. 1

Fig. 2



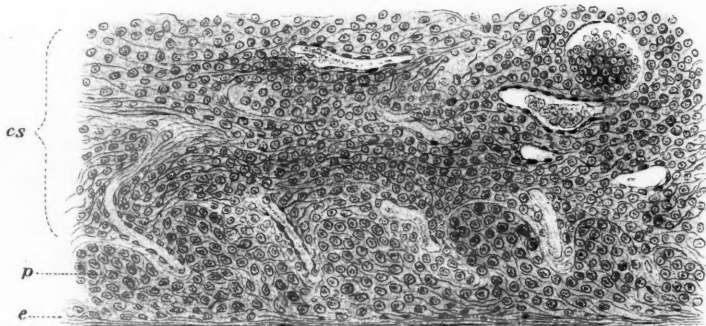
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Fig. 3



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Fig. 4



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Fig. 5

Tab. X.



Fig. 6

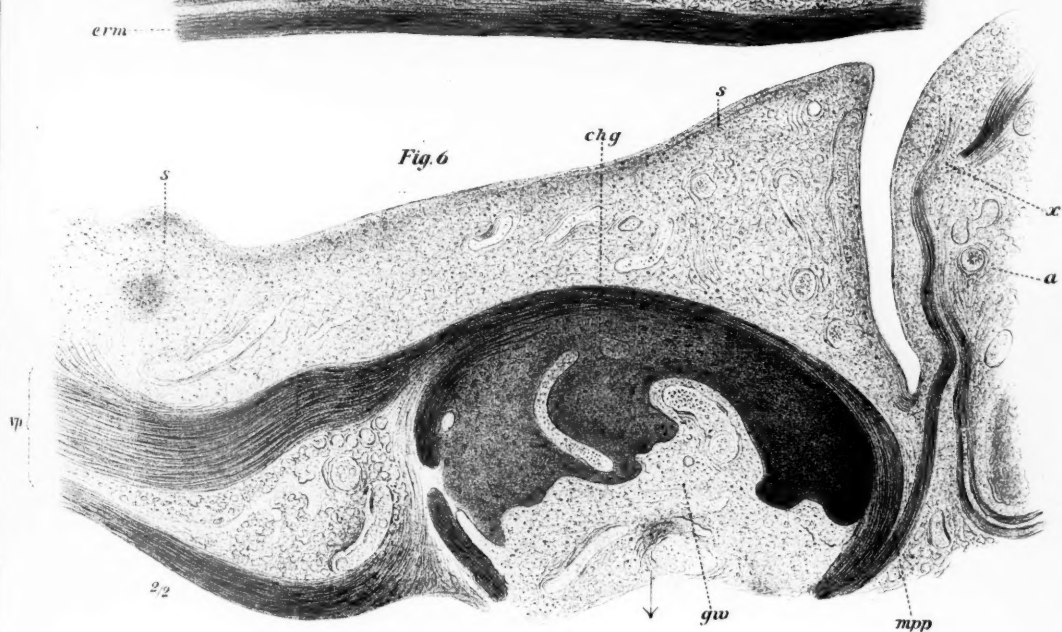
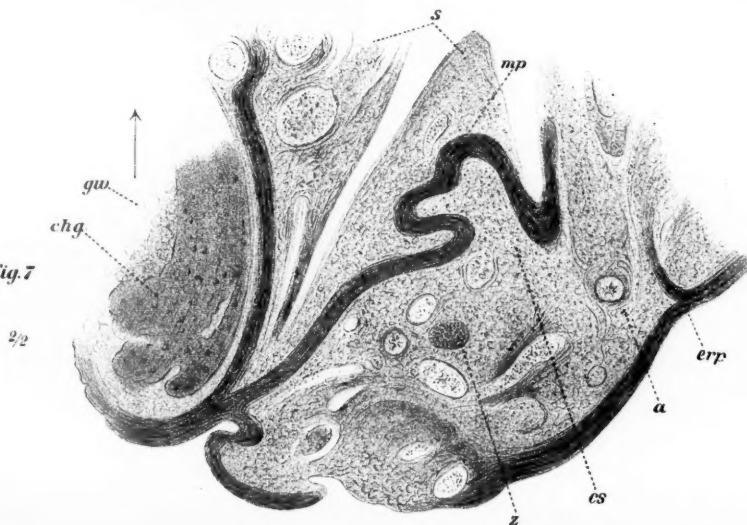


Fig. 7



F. Voth, a. n. n. 50.

Vorlag v. J. F. Forgmann, Wiesbaden.

Lith. Anst. v. C. Kersch, Leipzig.

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